



# DEL MEDICAL

## Direct Ray EPEX Omniflex IV System User Manual



EPEX Omniflex IV

P/N 8000-EPEXOMNIUM

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## **August 2005**

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### **CAUTION**

**Federal (USA) Law restricts this device to sale by or on the order of a physician (or properly licensed practitioner).**



**Attention: Consult Accompanying Documents - As Applicable**

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## **Glossary**





# About This Manual

## Audience

This manual is intended for users of the Del EPEX/Omniflex IV General Radiography System, to acquire medical diagnostic X-ray images. It provides operating instructions for the system.

## Indications for Use

The EPEX/Omniflex IV System has application whenever DirectRay radiographic images are created, and transmission of these images and related text are required from DirectRay technology to hardcopy, softcopy, or archive.

Follow all safety labels on the equipment.

## Prerequisites

The procedures in this manual assume that you know how to do the following operations related to the system's graphical user interface:

- Perform mouse and trackball operations, such as click, drag and select
- Select from menus
- Click buttons
- Enter information in text fields
- Select options
- Select entries from pop-up or drop-down lists
- Use scroll bars

## Scope

This manual contains information about the EPEX/Omniflex IV System and its operational features.

# Organization

This manual is organized into the following chapters and appendices:

## **Chapter 1: Introduction**

Illustrates and provides a brief overview of the EPEX/Omniflex IV System functions.

## **Chapter 2: Basic Operations**

Provides basic information about using the EPEX/Omniflex IV System to acquire images and send them to output devices. It also includes procedures for EPEX/Omniflex IV System start-up, shutdown, and X-ray tube warm-up.

## **Chapter 3: Managing the Image Output Queues and Resending Images**

Describes the procedures for managing the image output queues, resending previously acquired images that are still stored in the system, and repreviewing images that have not been reclaimed.

## **Chapter 4: Protecting Patient Records**

Explains how to protect patients and their related images from being deleted by the system.

## **Chapter 5: Maintaining System Components**

Explains how to perform maintenance of the EPEX/Omniflex IV System.

## **Chapter 6: Troubleshooting**

Explains how to perform basic troubleshooting operations. It identifies and explains how to handle common system problems that do not require service intervention, and provides a listing of system alarms along with the required response actions.

## **Appendix A: Specifications**

Lists the specifications for the EPEX/Omniflex IV System.

A glossary follows Appendix A.

# Conventions Used in This Manual

**Note:** Notes provide additional information, such as expanded explanations, hints, or reminders.

This manual uses three types of special messages to emphasize information or point out potential risks to personnel or equipment.

A sample of a note is shown in the margin to the left.

Samples of cautions and warnings are shown below.



**CAUTION**

**Cautions point out procedures that you must follow precisely to avoid damage to equipment, loss of data, or corruption of files in software applications.**



**WARNING**

**Warnings point out procedures that you must follow precisely to avoid injury to yourself or others.**



# Chapter 1

## Introduction

This chapter provides an overview of the EPEX/Omniflex IV System. It includes a general description of the system's functions and descriptions of each component, as well as a description of possible output devices, optional image acquisition workflows, and Safety and Compliance.

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# What Is the EPEX/Omniflex IV System?

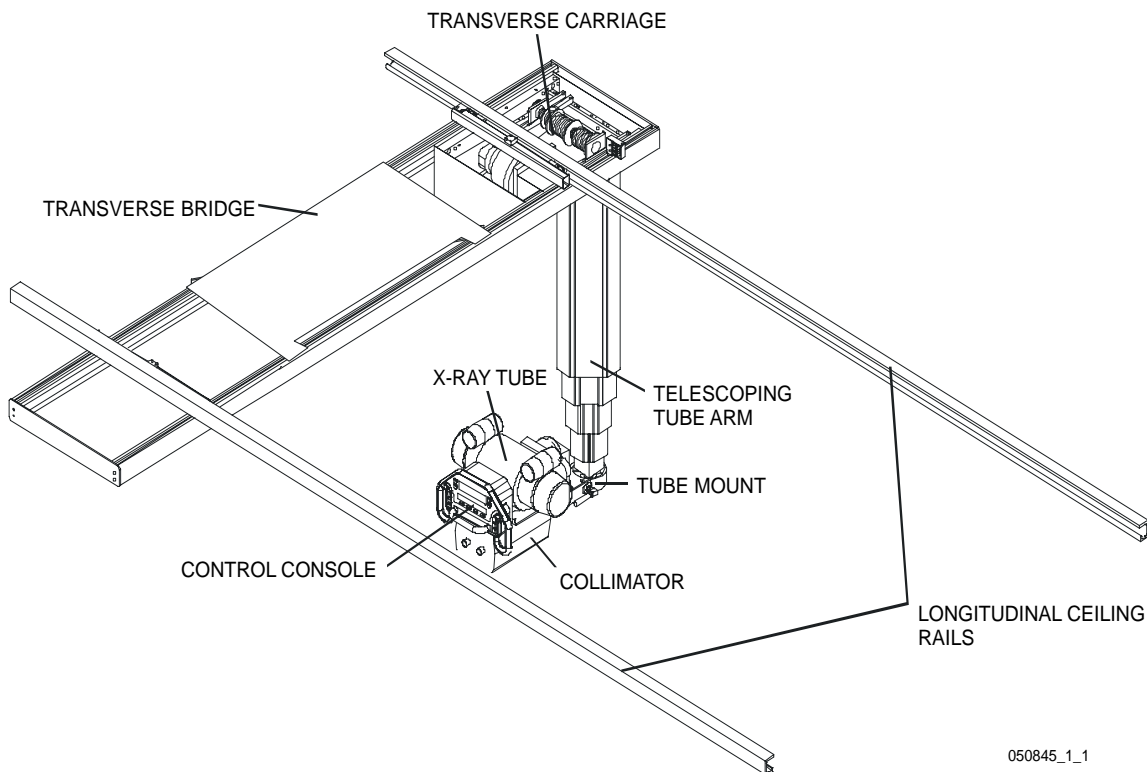
The EPEX/Omniflex IV System is a complete filmless, computer-controlled radiographic system consisting of:

- Overhead tube crane
- X-ray Generator
- Articulating arm and Bucky support
- Radiographic table
- X-ray tube and Collimator
- Bucky and DirectRay<sup>®</sup> Detector
- DirectRay Console

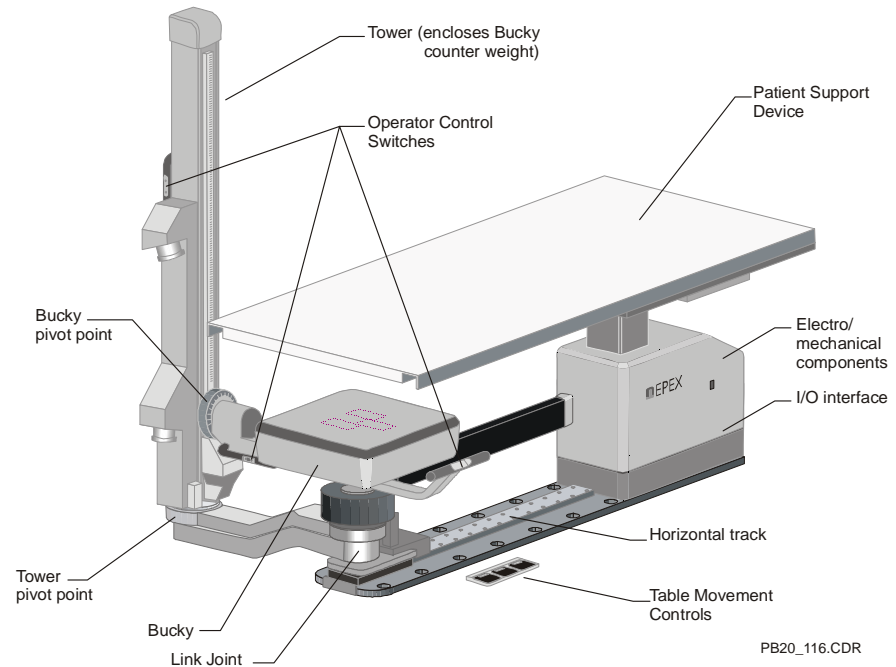
DirectRay is technology that optimizes the X-ray information for the highest quality images, without film. For a complete description, refer to the topic “What Is DirectRay?” on page 1-3.

The EPEX/Omniflex IV System has been designed for a full range of exams using a single DirectRay Detector.

**Figure 1-1. EPEX/Omniflex IV Overhead Tube Crane Components**



**Figure 1-2.**  
EPEX/Omniflex IV  
Radiographic Table



## What Is DirectRay?

DirectRay directly captures and converts X-ray energy into digital electrical signals.

- The captured signals (14-bit image data) are immediately transmitted into a DirectRay Controller. The 14-bit linear data is converted into 12-bit log data.
- An Exam Specific Algorithm (ESA), associated with the user-selected radiographic procedure and position, is used to create a look-up table (LUT) for the image.
- The LUT is applied to the 12-bit log data to optimize the image data prior to viewing it on the DirectRay Console monitor. If the user accepts the image, the LUT is sent with the image data to the selected output devices.

## Indications for Use

The EPEX/Omniflex IV system has applications whenever DirectRay radiographic images are created, and transmission of these images and related text are required from DirectRay technology to hardcopy, softcopy, or archive.

Follow all safety labels on the equipment.

# System Functions

Table 1-1 indicates where you can find information about specific system functions.

**Table 1-1.** EPEX/Omniflex IV Functions

EPEX/Omniflex IV Functions	For More Information
<b>Operator Input</b>	
Associate patient data with radiographic images	Chapter 2
Define the study	Chapter 2
Select the output destinations	Chapter 2
Modify output device parameters	<i>DirectRay Console Administrator's Guide</i>
Save an incomplete procedure	Chapter 2
Close a procedure	Chapter 2
Work with multiple open studies	<i>DirectRay Console User's Guide</i>
<b>Projection</b>	
Position the Radiographic Table and Bucky to support a wide variety of radiographic projections	<i>EPEX Radiographic Table User's Guide</i>
Position the X-ray tube to support a wide variety of radiographic projections	Chapter 2
<b>Image capture and processing</b>	
Adjust technique settings	<i>DirectRay Console User's Guide,</i>
Capture the required X-ray image	Chapter 2
Preview, accept, or reject the image	Chapter 2
Crop images	<i>DirectRay Console User's Guide,</i>



**Table 1-1.** EPEX/Omniflex IV Functions

<b>EPEX/Omniflex IV Functions</b>	<b>For More Information</b>
<b>Administrative</b>	
Resend images	Chapter 3
Repreview images	Chapter 3
Protect selected patient/image files from reclamation	Chapter 4
Calibrate the DirectRay Detector	Chapter 5
System administration tasks	<i>DirectRay Console Administrator's Guide</i>

## System Components

The EPEX/Omniflex IV is composed of the following components:

- DirectRay Detector
- X-ray tube and Collimator
- Radiographic table with articulating arm and Bucky
- Overhead tube crane
- DirectRay Console with DirectRay Controller. The following are contained on and within the DirectRay Console cabinet:
  - CPU (Central Processing Unit)
  - Monitor
  - Keyboard
  - Pointing Device
  - Bar Code Reader (optional)
  - WAMI (Wiring Adaptable Machine Interface)
  - Uninterruptible Power Supply (UPS)
- X-ray Generator

## DirectRay Detector/Bucky

The Bucky includes:

- The DirectRay Detector
- A grid with the DirectRay Detector
- AEC (Automatic Exposure Control)

You can use the positioning controls and rotation system to position the DirectRay Detector for a full range of patient needs.

## X-ray Tube and Collimator

The EPEX/Omniflex IV system includes:

- Rotating anode X-ray tube
- Collimator with shutter control

## Radiographic Table

The Radiographic Table is an X-ray table, articulating arm, and Bucky support subsystem integrated into the Del EPEX/Omniflex IV General Radiography System. The Bucky support is an articulated structure that is attached to the baseplate assembly for longitudinal travel. You can position the Bucky around the table and patient, thus accommodating a variety of radiographic projections. The support tower is fully counter-balanced with the Bucky installed, permitting the Bucky to be positioned with a minimum of effort.

The Radiographic Table features include:

- 4-way floating table top for positioning ease
- Capacity of up to 203 kg (450 lb)
- 102 to 188 cm (40 to 72 in.) source-to-image distance (SID)
- Removeable grid for low dose extremity and pediatric views
- Head-to-toe Bucky range of motion
- Full upright and chest capability

## X-ray Generator

The X-ray Generator has the following features:

- Operator control through the DirectRay Console user interface
- Anatomical pre-programmed exposure factors

## Omniflex IV Overhead Tube Crane

The Omniflex IV overhead tube crane is a ceiling-mounted overhead X-ray tube crane and Collimator suspension system. It provides flexibility in X-ray room design since it occupies no floor space and the rail design allows the tube to operate within a large area as defined by the ceiling rails. The telescoping tube arm allows the tube to be lifted up out of the way when not in use.

## DirectRay Console

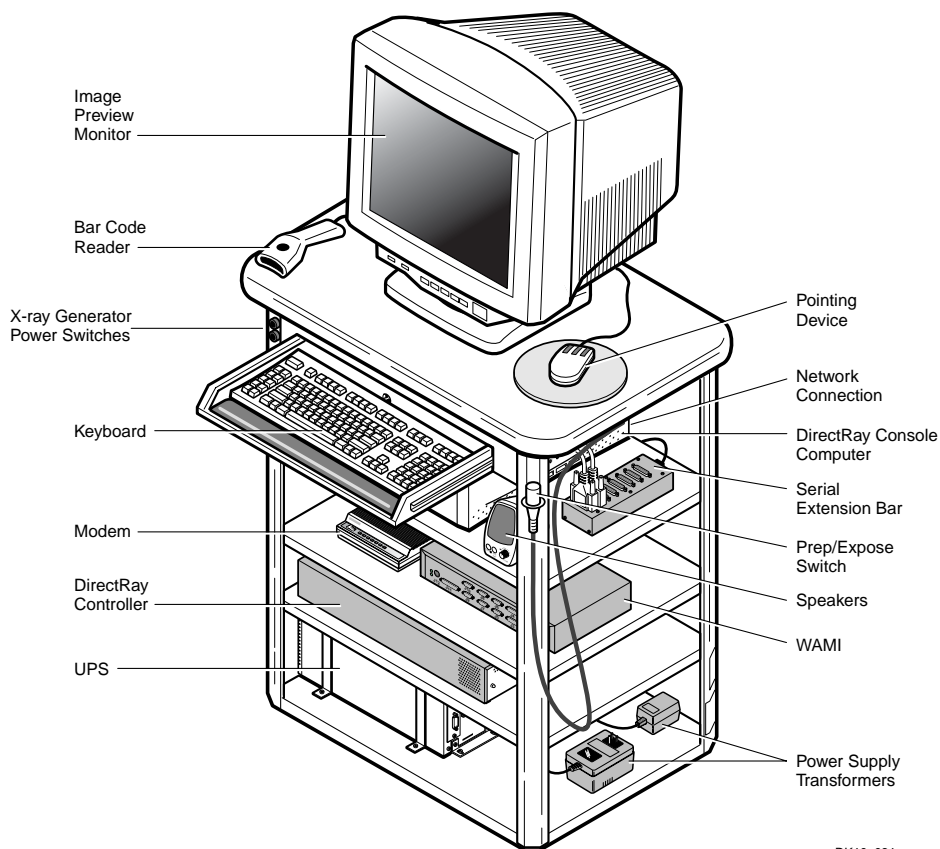
The DirectRay Console is the interface between the operator, the other system components, and the Hospital Information System/Radiology Information Systems (HIS/RIS). The DirectRay Console application allows you to perform the following functions:

- Input or retrieve patient and exam data
- Control the exposure and image capture subsystems
- Acquire and process digital X-ray image data
- Output patient and exam data
- Administrative tasks

The DirectRay Console includes the following hardware components, shown in Figure 1-3:

- Computer with monitor, keyboard, pointing device (mouse or trackball), and modem
- Uninterruptible power supply (UPS)
- DirectRay Controller
- Prep/Exposure switch
- Bar Code reader, (optional)
- Wiring Adaptable Machine Interface (WAMI)

**Figure 1-3.**  
DirectRay Console  
Components



DK10\_031.eps

## Output Devices

You can send images acquired with the EPEX/Omniflex IV system to:

- Image printers (for hardcopy)
- Workstations (for display)
- Archive systems (for storage)

**Note:** Output devices are not a part of the system. Contact your Del representative for a list of compatible output devices.

The system uses the DICOM (Digital Imaging and Communications in Medicine) protocol to send images and related information to output devices. DICOM is a standard that defines the characteristics of data communication between medical imaging equipment. The DICOM standard was developed by the National Electrical Manufacturer's Association and the American Council of Radiology.

For the latest list of approved DICOM connections, see your Del representative. For information about how to operate an output device at your site, refer to the device's documentation.

# Image Acquisition

Patient data available in the facility's Hospital Information System (HIS) or Radiology Information System (RIS) can be imported into the system using the Modality Worklist function. Such data may also be obtained from the system's own temporary records of recent radiographic examinations, or from keyboard entries provided by the operator. Patients whose records are accessible through the facility's HIS/RIS network are typically provided with a bar-coded bracelet. A bar code reader connected to the DirectRay Console is used to scan the paperwork or requisition form and identify the patient. Key patient data from the facility's data base is then entered into the DICOM files for the current radiographic examination.

If the facility is not equipped with a HIS/RIS, the system can be prompted to search its own temporary records and copy relevant patient data if it is available. If such data is not available, the operator is prompted to enter patient data manually. It should be noted that the storage capacity of the system is limited and the records of patients who were examined some time ago are not likely to still be in the system.

# Safety and Compliance Information

## Safety Precautions

- Do not remove covers from any part of the equipment for any purpose.
- Do not defeat or bypass built-in equipment safety features.
- Do not attempt any repairs if the equipment fails to operate correctly. Only qualified Del Field Service Engineers or Del authorized personnel should service the system.
- Do not attempt to move equipment, or connect or disconnect any communication cables. Call a person qualified and authorized to alter the equipment installation.
- Observe all warnings and cautions in the procedures.
- Follow all safety labels on the equipment.
- Keep fingers, hands, and tools clear of moving parts.
- Route cables properly to eliminate tripping hazards.

## General Use Cautions and Warnings



**CAUTION**

Federal (USA) law restricts this device to sale by or on the order of a physician (or properly licensed practitioner).



**WARNING**

The EPEX/Omniflex IV system includes no user serviceable parts. For service assistance, contact Del.



**WARNING**

The EPEX/Omniflex IV system produces ionizing radiation.



**WARNING**

The DirectRay Detector may only be operated in an area that is located beyond the 20 Gauss limit.



**WARNING**

The EPEX/Omniflex IV system and associated cables must not be operated in the presence of moisture.



**WARNING**

The EPEX/Omniflex IV system is not suitable for operation in the presence of a flammable anesthetic mixture with air, oxygen, or nitrous oxide.



**WARNING**

Excessive use of the keyboard and mouse or trackball may result in repetitive strain injury.

## Cleaning Cautions



**CAUTION**

Do not spray cleaning solution directly onto the equipment. Moisten a cloth with the solution and wipe the equipment.



**CAUTION**

Do not immerse the equipment in liquid.



**CAUTION**

Do not autoclave the equipment.

## Symbols



Power Off (used with the DirectRay Console UPS)



Power On (used with the DirectRay Console UPS)



Ethernet Connection



Twisted Pair Ethernet Connection



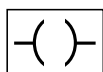
Explosive Gas (flammable)



Attention—Read the CAUTION or WARNING statement that follows



Non-Anesthetic Proof



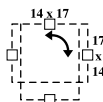
Universal Interface Connection Identifiers



Sound



Earphones



DirectRay Detector Orientation Identifier (on the Bucky)





Protective Earth Ground



Hazardous Voltage



Power On Indicator



Hard Drive



Standby Switch (used with CPU)



On Line Indicator (used with X-ray Generator switch at DirectRay Console)



Off Line Indicator (used with X-ray Generator switch at DirectRay Console)



Prep/Exposure Switch



X-ray Expose Switch



Do Not Immerse In Liquid



This product contains no field-serviceable parts



Special Cleaning Instructions



Lifting Warning

One or more of the following regulatory symbols are found on the equipment:



UL Classified Device



UL Listed Device



UL Recognized Device



CSA Listed Device



ETL Listed Device

## United States Federal and State Regulations

EPEX/Omniflex IV systems conform to the United States Code of Federal Regulations, 21 CFR 1020.30 “Diagnostic X-Ray Systems and their major components.” However, additional state regulations may apply for X-ray products. This may require notifying your state regulatory agency about your installation and/or operator training and certification.

It is the responsibility of the user to contact the applicable state radiation control agency to verify that your installation is in compliance with regulations in your state governing installation and use of X-ray equipment.

## IEC Regulations

EPEX/Omniflex IV systems comply with the requirements of IEC 60601-1 and with the following IEC standards:

IEC 60601-2-7

IEC 60601-1-3

IEC 60601-1-1

IEC 60601-1-2

IEC 60601-2-28

IEC 60601-2-32

IEC 60825-1

Software used in the EPEX/Omniflex IV system was developed using IEC 60601-1-4 as a guide.

## Canadian Regulations

EPEX/Omniflex IV systems comply with CSA 22.2 No. 601.1.

## Manufacturer's Responsibility

This equipment is sold with the understanding that Del, its agents and representatives, do not accept any responsibility for overexposure of patients or personnel to X-radiation.

Furthermore, Del does not accept any responsibility for overexposure of patients or personnel to X-radiation generated by this equipment as a result of poor operating techniques or procedures.

Also, no responsibility is assumed for any unit that has not been serviced and maintained in accordance with the technical service manual, or which has been modified or tampered with in any way.

## Positive Beam Limitation

The EPEX/Omniflex IV system is provided with a positive beam limitation (PBL) system that automatically adjusts the X-ray field to the size of the receptor. The PBL system is operational in the following two positional orientations of the EPEX/Omniflex IV system (these define the normal operating mode of the system):

- Standing Chest Mode (Horizontal SID): The PBL system is functional at 40 and 72 in. SIDs when the Bucky is positioned in the Standing Chest orientation.
- Under Table Mode (Vertical SID): The PBL system is functional in the Under Table mode. In this mode, the Bucky is positioned under the table top with the plane of the receptor oriented horizontally.
- Many other positional orientations of the EPEX/Omniflex IV system are possible and are used for special procedures. Bypass of the PBL system occurs in these special procedure orientations such that the PBL system is not functional and the system reverts to a manual collimation mode of operation.

## Caution Regarding Small-Detail Object Imaging

As with all digital imaging devices, there is the potential that small-detail structures, high-contrast edge structures, and fine-line structures with a repeating pattern could appear differently in the digital image than in an image created with an analog device—such as screen–film system—or with another digital device having smaller individual detector elements. For example, for a sharp-edged object, the edges of that object may appear to have “stair-steps” when in fact the object edge does not have such structure. This is an effect of digital undersampling.

For small-detail objects having a size on the same order of magnitude as an individual pixel or smaller, the apparent contrast of that object can vary based on the position relative to the individual detector element locations. For example, the contrast of a single spherical object the same size as a pixel would have a different appearance if the object were imaged directly overlying a detector element (highest contrast) or placed at the intersection of four detector elements (lowest contrast). Objects inherently smaller than individual pixels will have a lower apparent contrast because of the digital sampling of the analog radiation intensity signal over an area larger than the small object. In each case, a lower apparent signal-to-noise can result in reduced visibility of such objects.

## Restrictions on Use

The customer is responsible for assuring that accessories used with the EPEX/Omniflex IV system do not degrade the safety of the system.

Accessories and interfacing equipment used in conjunction with the EPEX/Omniflex IV system and located outside the patient environment may be exempt from EN60601-1. Such equipment must, however, conform to EN60601-1-1 and therefore to standards applicable to information technology equipment such as EN60950 and to applicable electromagnetic compatibility requirements.

## Authorized EU Representatives

The manufactures or parts and subsystems in the EPEX-Omniflex Overhead Tube Crane are represented in the European Union by the following:

**Villa Sistemi Medicali**  
Via delle Azalee 3  
20090 Buccinasco (MI)  
**Italy**



# Chapter 2

## Basic Operations

This chapter provides basic information about using the DirectRay Console to acquire images and send them to output devices. It also includes procedures for system start up, shut down, and X-ray tube warm-up.

### Contents

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Warming Up the X-ray Tube .....	2-9
Capturing Images .....	2-11
Powering Down the System Components .....	2-57

# Starting Up and Logging On to the System

To start up the system and prepare for acquiring patient images:

Step	Action
1	Power up the uninterruptible power supply (UPS), which in turn powers up the DirectRay Detector and DirectRay Controller.
2	Power up the X-ray Generator.
3	Check that the other X-ray system components are on and working properly.
4	Power up the DirectRay Console CPU.
5	Log in to the CPU's operating system.
6	Log in to the DirectRay Console application.

The following topics provide instructions for performing each of these steps.



**CAUTION**

The DirectRay Console CPU should be powered down once a day to ensure a complete system reset. If this is not done, system performance deteriorates.



**CAUTION**

The DirectRay Detector should be powered on at least 1 hour before intended use. If it is used sooner than 1 hour after being powered on, image quality can be affected. For more information about powering on the DirectRay Detector, refer to the topic "Step 1: Powering Up the UPS" on page 2-3.



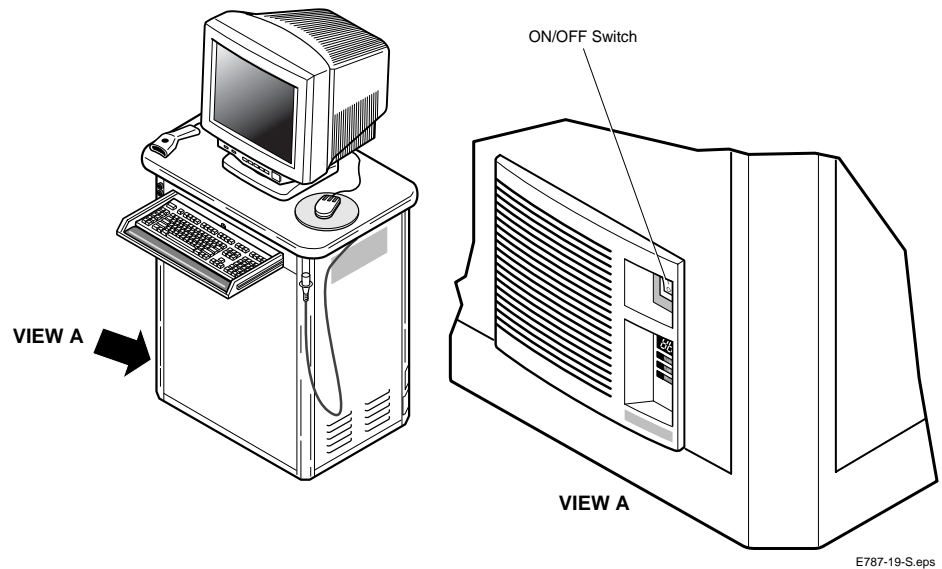
## Step 1: Powering Up the UPS

***Note:** If at least five minutes does not elapse between Steps 1 and 4, you may get a DirectRay power up failure.*

**To start the DirectRay Detector and DirectRay Controller,** press the UPS power switch on the left side of the DirectRay Console cabinet to the On (I) position, as shown in Figure 2-1.

Once the power switch is in the On (I) position, you must wait at least five minutes before powering up the DirectRay Console. Refer to the next topic.

**Figure 2-1.**  
UPS Power Switch

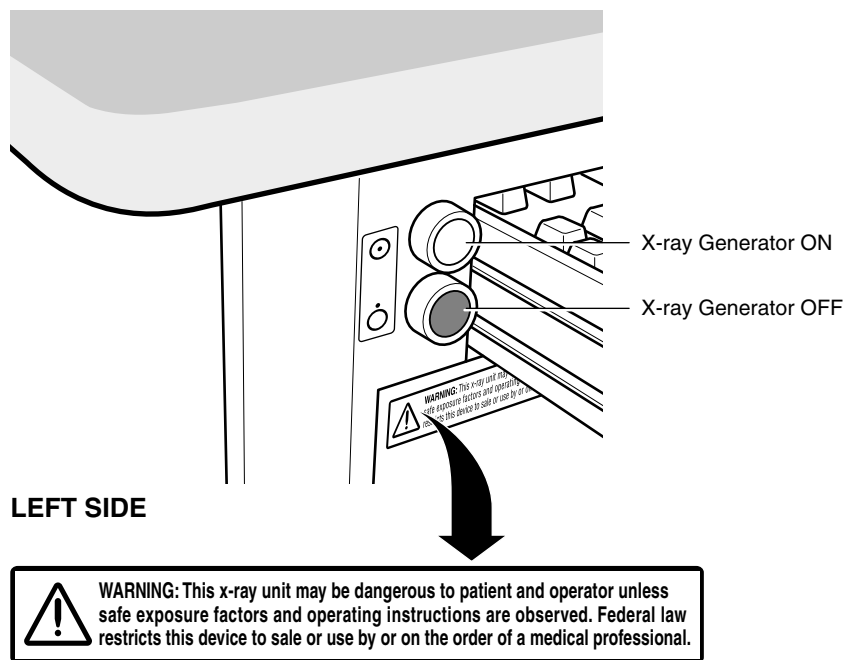


## Step 2: Powering Up the X-ray Generator

Starting the X-ray Generator typically also powers up other X-ray components, such as the X-ray tube, the Collimator, the overhead tube crane to which the X-ray tube is attached, the Bucky, and the radiographic table.

**To start up the X-ray Generator,** press the ON power button at the front left of the DirectRay Console cabinet, as shown in Figure 2-2.

**Figure 2-2.**  
Generator Power  
Controls



GS10\_022.eps

## Step 3: Checking the System

Once the X-ray Generator is powered on, perform the following checks:

- Remove any patient supports or other objects so they do not interfere with the movement of the X-ray tube's suspension arm.
- Press the Collimator light switch and verify that the light comes on.
- Verify that the Collimator display indicates the current SID and the Collimator opening.
- Check the releases on the overhead tube crane, the Bucky, and the radiographic table to ensure that the controls are operating properly.

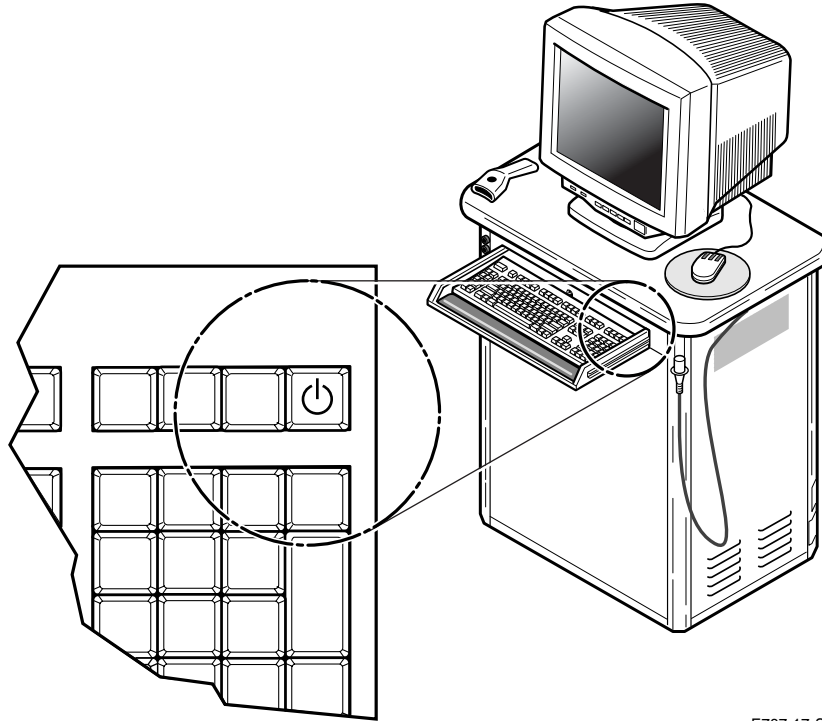
You can now power up the DirectRay Console.

## Step 4: Powering Up the DirectRay Console CPU

**Note:** Before you power on the DirectRay Console CPU, ensure that the DirectRay Detector and DirectRay Controller have completed their startup sequence (wait at least five minutes after you power on the UPS).

**To power up the DirectRay Console CPU,** press the power key located at the upper-right corner on the CPU keyboard (refer to Figure 2-3). The CPU powers up and the monitor (which should typically be left on but might be in “sleep” mode) “wakes up.” If the monitor is not on, press its power button.

**Figure 2-3.**  
DirectRay Console  
Power Key



E787-17-S.eps

**Note:** The dual input monitor switch toggles between the DirectRay Console and the DirectRay Controller.

Once the CPU is powered on, the monitor displays messages related to the progress of the CPU's operating system startup. The CPU takes about four minutes to complete this sequence.

When the operating system is loaded, the Login window displays.

## Step 5: Logging In to the CPU's Operating System

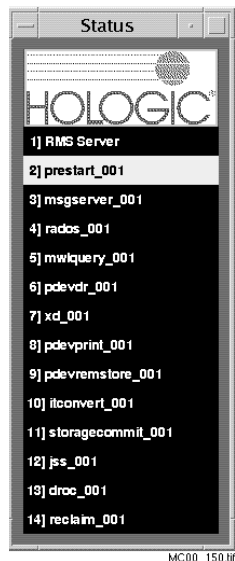
When you power on the DirectRay Console, a grey SUN Microsystems banner displays.

**To log in to the CPU's operating system:**

Step	Action
1	Enter the appropriate login name at the <i>Please enter your name:</i> prompt: <ul style="list-style-type: none"> <li>• <b>tech</b> for technologists</li> <li>• <b>mgr</b> for system administrators</li> </ul>
2	Press the Enter key.  The <i>Please enter your password:</i> prompt displays.
3	Enter your password, then press the Enter key. (If you do not know your password, see your System Administrator.)  <i>Note: No characters display as you enter your password.</i>  <i>Note: If you make a mistake when entering the login name or password, you can click the <b>Start Over</b> button to clear the fields and start again.</i>  After displaying progress messages, the DirectRay Console application Status window displays.

*Note: Depending on your system configuration, the tasks on your Status window may differ from the ones depicted in the sample shown here.*

The Status window, shown below, lists the initialization tasks for DirectRay Console functions. Each task is highlighted once it has become active and passed setup. After the status tests are complete, the application Login window displays at the upper-left corner of the screen. Go to the next topic to log in to the DirectRay Console application.



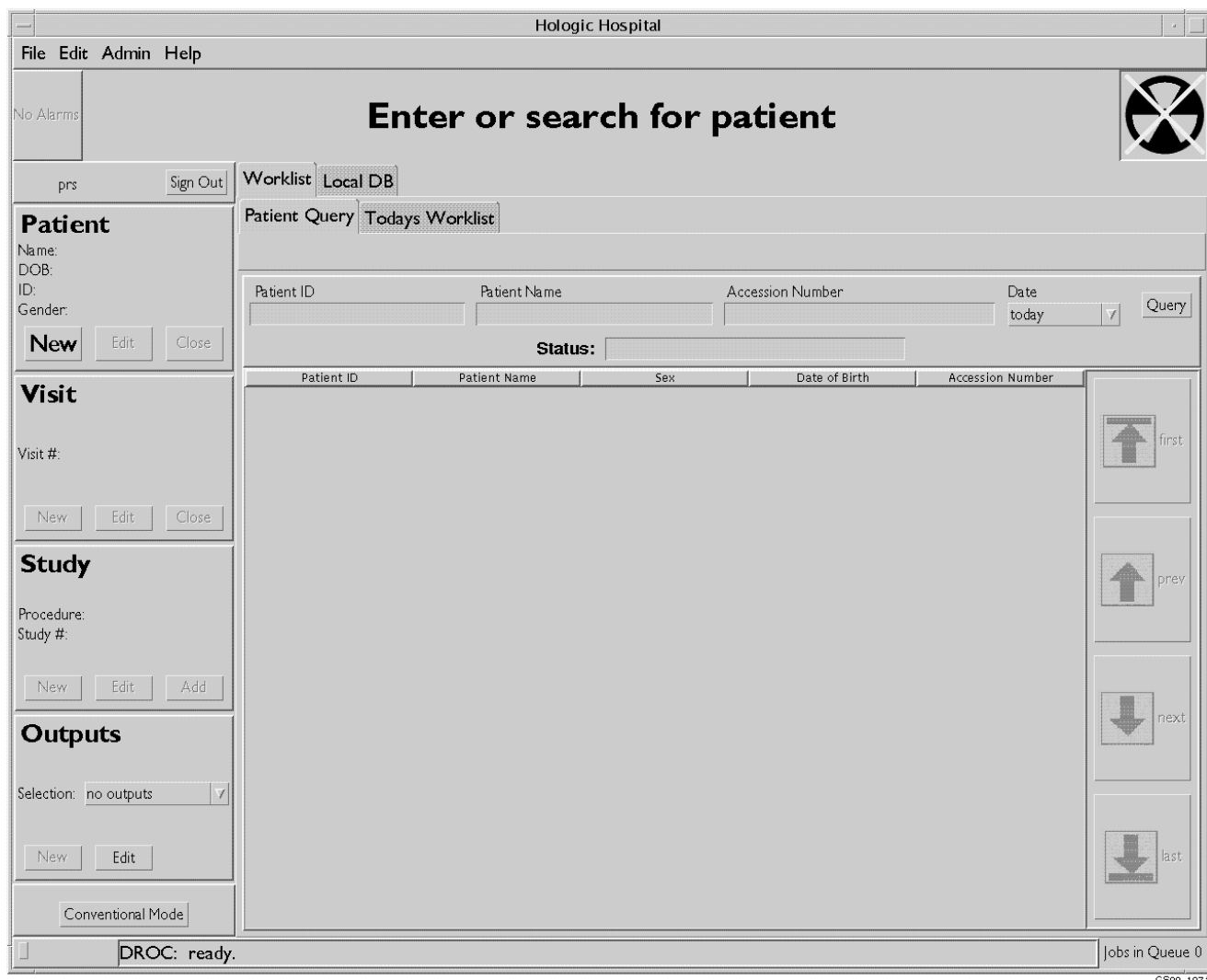
## Step 6: Signing In to the DirectRay Console Application

**Note:** See your System Administrator if you do not know your login or password.

To sign in to the DirectRay Console application, choose your name from the **Identify Yourself** pop-up menu, enter your password, and click the **OK** button.

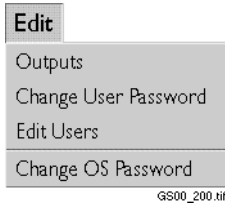


The DirectRay Console application window displays. If the X-ray tube has been inactive for a period of time, you must warm it up, as explained in the topic “Warming Up the X-ray Tube” on page 2-9. Otherwise, you can open a patient record and start capturing images.



## Changing Your DirectRay Console User Application Password

**To change your DirectRay Console user application session password:**



Step	Action
1	<p>From the <b>Edit</b> menu, choose <b>Change User Password</b>.</p> <p>The Change Password window displays.</p> <p>A screenshot of a 'Change User Password' dialog box. It has a title bar with a minus sign. Inside, it says 'User: prs'. There are three text input fields: 'Enter Current Password:', 'Enter New Password:', and 'Reenter New Password:'. At the bottom right are 'Cancel' and 'OK' buttons. Below the dialog box, the text 'GS00_108.tif' is visible.</p>
2	<p>In the Enter Current Password field, type your current password, then click the <b>OK</b> button.</p> <p><i><b>Note:</b> An asterisk (*) character displays for each character you type to protect the privacy of the password.</i></p>
3	<p>Type the new password in the Enter New Password field and in the Reenter New Password field.</p> <p><i><b>Note:</b> This is required to verify that you are typing the new password correctly, since you cannot see what characters you are typing.</i></p>
4	<p><b>To save the change</b>, click the <b>OK</b> button.</p> <p><b>To cancel the change</b>, click the <b>Cancel</b> button.</p>


# Warming Up the X-ray Tube



Producing X-rays with a cold or improperly warmed tube considerably shortens the life of the X-ray tube. To prolong the life of the X-ray tube, do not acquire images without first warming up the tube.

The tube should be warmed up at the start of each day, and whenever the tube has been inactive for more than four hours.

## To perform the tube warm-up:

Step	Action
1	Ensure everyone is out of the X-ray room.
2	Close the Collimator shutter, using the shutter controls.
3	Cover the Collimator or the Bucky with a lead apron or position the X-ray tube so it will not expose the DirectRay Detector to unattenuated dosage.
4	In the DirectRay Console application main window, with no patient chosen, click the <b>Conventional Mode</b> button.  A warning dialog box displays.
	
5	Click the <b>OK</b> button.  The Conventional X-ray Mode window displays.
6	Set the technique settings, as instructed in the Tube Warm-up panel.
7	Take exposures until the heat units count reaches 7 to 9%.
8	When you have completed the exposures, click the <b>End Conventional Mode</b> button and remove the lead apron from the tube.

The DirectRay Detector is now disabled, but the X-ray tube is enabled. If you wish to use a conventional film cassette or Computed Radiography, refer to the topic “Capturing Images on Film” in Chapter 3 in the *DirectRay Console User's Guide*.

Once the X-ray tube is properly warmed up, you can start capturing images. Go to the next topic.

Hologic Hospital

File Edit Admin Help

No Alarms

## Conventional X-ray Mode

Not for Digital Acquisition

prs

**Patient**

Name:  
DOB:  
ID:  
Gender:

**Visit**

Visit #:

**Study**

Procedure:  
Study #:

**Outputs**

Selection: no outputs ☒

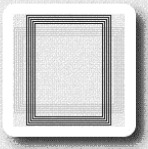
KVP  
**75**

mA  
**200**

mAs  
**040**


Time  
**0.200**

Orientation / AEC




Screen

AEC




Density

Focal Spot



Patient




**TUBEWARMUP PA SIZE2**

Control

Heat **0%**


**Recommended Tube Warmup Procedure**

- 1) Set technique parameters for tube warm up:
  - kVp = 75, mA = 200, mAs = 40, AEC = OFF, focal spot = large
- 2) Ensure that the detector is blocked from the X-Ray beam:
  - Manually close both vertical and horizontal collimator blades.
  - Use lead apron or screen to block the beam.
- 3) Make exposures 3 seconds apart until the heat units rise to 7 - 9%.
- 4) Click "End Conventional Mode" when you have finished the exposures.



Status:

DirectRay: Ready



DROC: ready.

Jobs in Queue 0

MC00\_158.M



# Capturing Images

## Overview for Capturing Images

**Note:** If you wish to use a conventional film cassette or Computed Radiography, refer to the topic “Capturing Images on Film” in Chapter 3 in the DirectRay Console User's Guide.

The general workflow for using the DirectRay Console to acquire and send images to the output devices involves the following steps:

Step	Action
1	Identifying the patient and visit.
2	Choosing output destinations.
3	Optionally, adjusting the exposure technique settings and the exposure sequence.
4	Adjusting the position and orientation of the table, Bucky, X-ray tube, and the Collimator shutter to accommodate patient orientation.
5	Exposing the patient.
6	Previewing, then accepting or rejecting the image.

You then repeat steps 3 to 6 for each image in the procedure.

Step	Action
7	Optionally, opening an additional procedure for this patient's visit.
8	Optionally, adding a view to the procedure in progress.
9	Optionally, select the Inverse Topography feature.
10	Closing the study.
11	When you are done taking exposures, logging out of the current DirectRay Console application session so that another user can log in.

Except for adjusting the position and orientation of the table, DirectRay Detector, X-ray tube, and the opening of the Collimator shutter, you perform all of these steps from the DirectRay Console user application's main window.

## Step 1: Identifying the Patient and Visit

Before capturing images, you must identify with which patient they are to be associated. Proper identification ensures that the image data are associated with the correct patient information.

Depending on the system configuration at your site, there are three ways for you to identify the patient and visit for which you want to acquire images, as described below.

**All systems allow you to identify patients and visits manually using the DirectRay Console's local database.** Whether you are acquiring images for a new or existing patient, you can identify a patient **manually** by:

- **Creating** a new patient record in the local database.
- **Selecting** a patient from those previously entered and currently stored in the local database. Unless protected by a key operator, patient records are stored only temporarily in the local database. Since database space is limited, the oldest patient records and their associated images are periodically deleted to reclaim space for new patients.

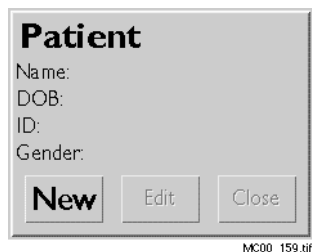
For more information about how to manually specify the patient and visit, refer to the topics “Adding a New Patient Manually” on page 2-13 and “Choosing an Existing Patient or Visit Using the Search Function” on page 2-15.

**If your system supports Modality Worklist queries,** you can retrieve patient information from a Radiology Information System. Refer to the topic “Choosing a Patient Using the Modality Worklist Query” on page 2-21.

**If your system supports bar code scanning,** you can use the bar code scanner to read in the patient ID, visit number, or some other unique identifying number. If the ID **is found** in the Modality Worklist (if this feature is available) or in the local DirectRay Console patient database, that corresponding patient, visit, and study is opened. If the ID **is not found**, you must enter that patient manually.

## Adding a New Patient Manually

To add a new patient when not using a barcode, click the **New** button in the Patient panel of the main window.



**Patient**

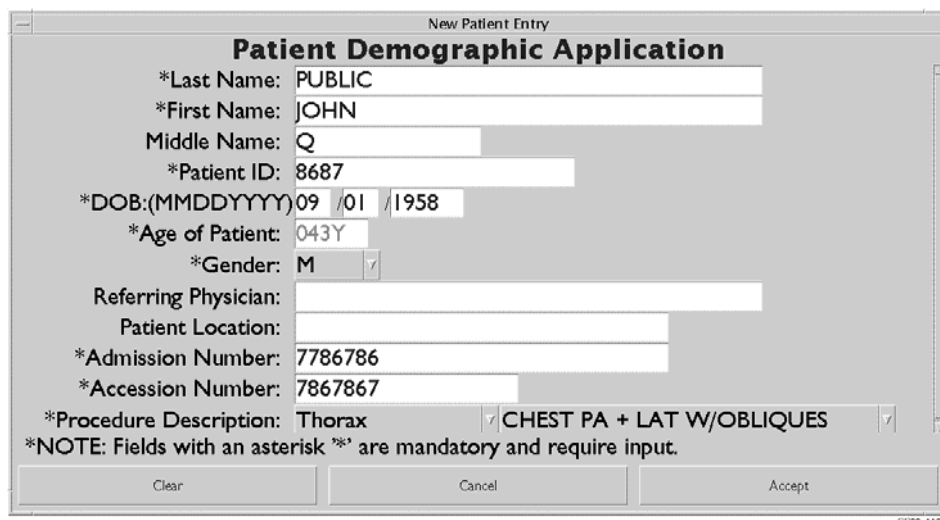
Name:  
DOB:  
ID:  
Gender:

**New** Edit Close

MC00\_159.tif

**Note:** Ensure you enter patient names and IDs correctly. Incorrect entries can cause duplicate patient records for the same patient, or make it more difficult to find the patient in future search operations.

The New Patient Entry window displays; a sample is shown below. Note that, for your site, the fields in this window may be different. In the sample, the visit number field is labeled “Admission Number.”



New Patient Entry

**Patient Demographic Application**

\*Last Name: PUBLIC  
\*First Name: JOHN  
Middle Name: Q  
\*Patient ID: 8687  
\*DOB:(MMDDYYYY) 09 /01 /1958  
\*Age of Patient: 043Y  
\*Gender: M  
Referring Physician:  
Patient Location:  
\*Admission Number: 7786786  
\*Accession Number: 7867867  
\*Procedure Description: Thorax CHEST PA + LAT W/OBLIQUES  
\*NOTE: Fields with an asterisk "\*" are mandatory and require input.

Clear Cancel Accept

G000\_110.tif

**Note:** When the CPU's storage space begins to run low, patient records and their corresponding images are deleted to make room for new images (oldest images and patient records first). For more information about patient and image reclamation, and how you can protect a patient record and associated images from being deleted, refer to Chapter 4.

Complete the fields in the window. Fields whose labels include an asterisk (\*) are required fields.

When specifying the procedure:

- From the first drop-down list, choose the exam type.
- From the second drop-down list, choose the procedure within that exam type.

**To save the patient information,** click the **Accept** button. The Creating/Editing Patient Information window closes.

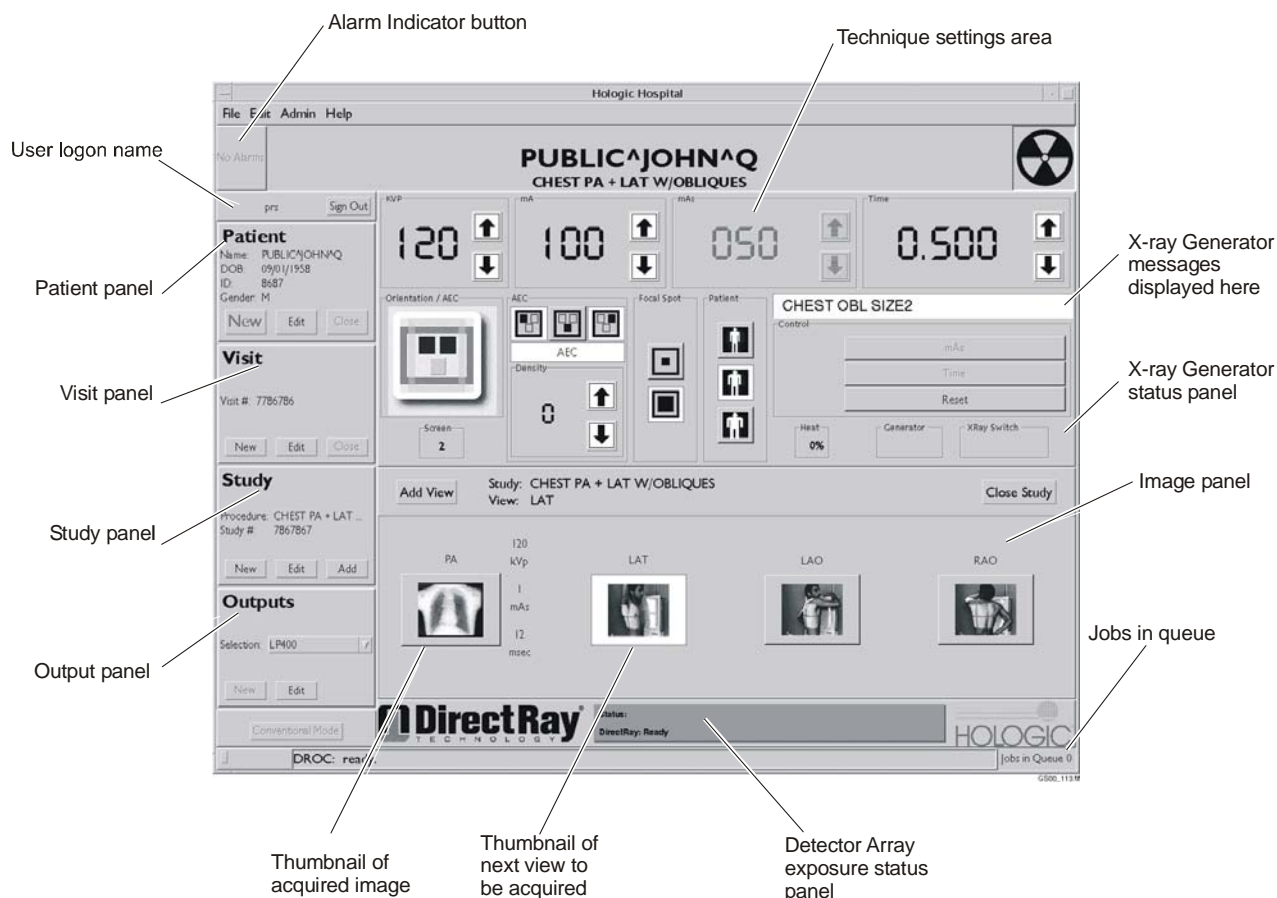
**To clear the patient information and reenter it,** click the **Clear** button.

**To cancel entry of the patient information,** click the **Cancel** button.

When you finish creating or modifying the patient information, the main window is updated, as shown in the sample screen below. Note that:

- The patient name displays in the Patient panel.
- The visit number displays in the Visit panel.
- The study ID displays in the Study panel.
- The chosen procedure name displays in the Study panel.
- The series of image views that are to be captured, as defined by the chosen procedure, are displayed.
- The exposure technique settings, relative to the chosen procedure, are displayed.

After entering and saving patient information, you are ready to choose the output devices to which you want to send the images. Refer to the topic “Step 2: Choosing Output Destinations” on page 2-29.



MC20\_306.cdr

## Choosing an Existing Patient or Visit Using the Search Function

**Note:** You can use the asterisk (\*) character as a wildcard character to broaden your search. For example entering **R\*ph** would return patients named **Randolph** and **Rudolph**. If using the wildcard character, make sure you include at least one other character (that is, don't enter only an asterisk) to avoid listing all patients or visits, which might take several minutes to complete.

You can choose an existing patient by first clicking the Local DB tab to search the local database, then using the Search function to list patients whose name, ID, or visit number match search criteria that you enter.

To search for an existing patient or visit in the local database:

- **To search by patient name**, click the **Patient Name** tab, enter the name in the search field, then click the **Search** button or press the Enter key. Note the following guidelines when entering names:
  - Names are stored in the database as LAST^FIRST^MIDDLE. When specifying two or more parts to a name, you **must** include the caret (^) character between the name parts (for example, **DOE^J\***).
  - Because names are stored in the format LAST^FIRST^MIDDLE, searching for the first name **John** requires preceding it with an asterisk (that is, **\*John**).
  - Search entries are case insensitive; you can enter upper or lower case letters.
- **To search by patient ID**, click the **Patient ID** tab, enter the ID in the search field, then click the **Search** button or press the Enter key.
- **To search by visit number**, click the **Visit** tab, enter the visit number in the search field, then click the **Search** button or press the Enter key.

The list of patients or visits matching the search criteria that you entered displays (for example, refer to the following sample window).

**Hologic Hospital**

File Edit Admin Help

No Alarms

**Enter or search for patient**

prs Sign Out Worklist Local DB

**Patient**

Name:  
DOB:  
ID:  
Gender:

New Edit Close

**Visit**

Visit #:

New Edit Close

**Study**

Procedure:  
Study #:

New Edit Add

**Outputs**

Selection: no outputs

New Edit

Conventional Mode

Patient Name Patient ID Visit

Enter Patient Name (\* to search):

pu\*

Search

Search Results: 4 entries

Name	ID	Sex	DOB
Public^David	00008	M	19490919
Public^Jane Q	00001	F	19680618
Public^Jane^Q.	23456789	F	19760917
Public^John^Q.	12345678	M	19750917

first

prev

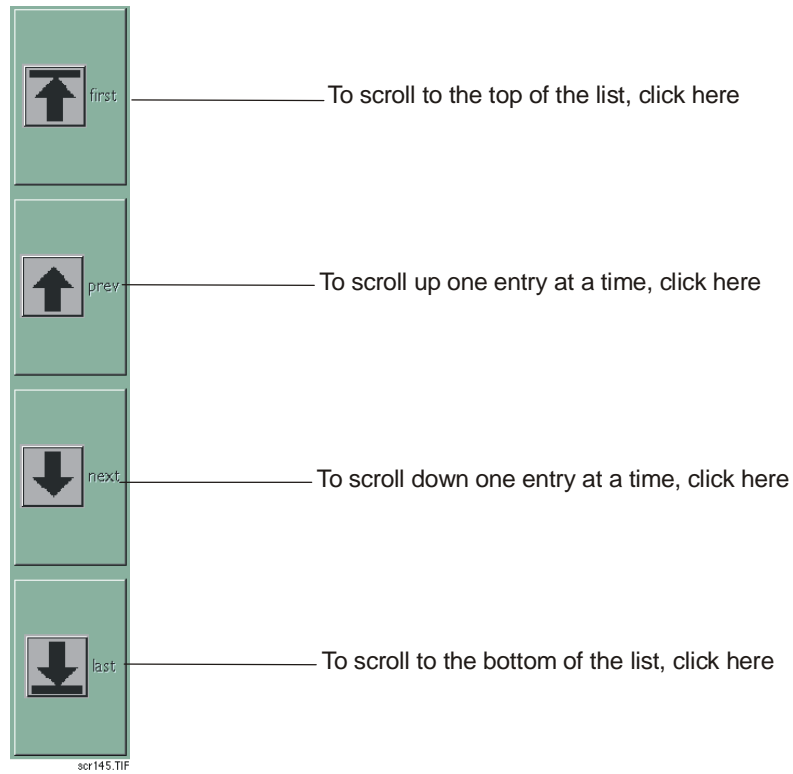
next

last

Jobs in Queue 0

MC00\_162.tif

**To navigate through a list that is too long to be entirely displayed, refer to the following illustration.**



DK20\_032.cdr

**To clear the list and start a new search, click on one of the other search tabs (for example, Patient ID or Visit).**

**To choose a patient or visit from the list, click on the entry:**

- ***If the patient entry that you chose has multiple visits associated with it, the visits are listed after clicking the patient entry. Click on the visit you want to open.***
- ***If the visit entry that you chose has multiple studies associated with it, the studies are listed after clicking the visit entry. Click on the study you want to open. The study list includes the status of each study, as shown on the following page.***

FileEditAdminHelp

No Alarms

prsSign OutWorklistLocal DB

Patient

Name: Public^John^Q  
DOB: 09/17/1975  
ID: 12345678  
Gender: M

NewEditClose

Visit

Visit #:

NewEditClose

Study

Procedure:  
Study #:

NewEditAdd

Outputs

Selection: Drystar

NewEdit

Conventional Mode

Public^John^Q.

Choose a Visit:

Search Results: 2 entries

Visit #	Ct	First Unfinished Study	Study Status
1234	2	SKULL 4 VIEWS ROUTINE	Scheduled
987654321	1	ABD COMP W/PA CHEST +/-OR DECUB(S)	Scheduled

first

prev

next

last

Jobs in Queue 0

MC00\_163.M



After making the final selection in the patient/visit/study hierarchy, that selection is opened in the main window, as shown below.

The screenshot displays the Hologic Hospital software interface. The main window title is "Hologic Hospital". The menu bar includes "File", "Edit", "Admin", and "Help". The patient name "Public^John^Q." is prominently displayed at the top right, next to a radiation warning symbol. Below the patient name, there is a "Sign Out" button. The left sidebar contains several panels: "Patient" (with fields for Name, DOB, ID, Gender, and buttons for New, Edit, Close), "Visit" (with Visit # and buttons for New, Edit, Close), "Study" (with Procedure and Study # fields and buttons for New, Edit, Add), and "Outputs" (with a Selection dropdown and buttons for New, Edit, and a Conventional Mode button). The main area is titled "Choose a Study:" and shows "Search Results: 2 entries". A table lists the results:

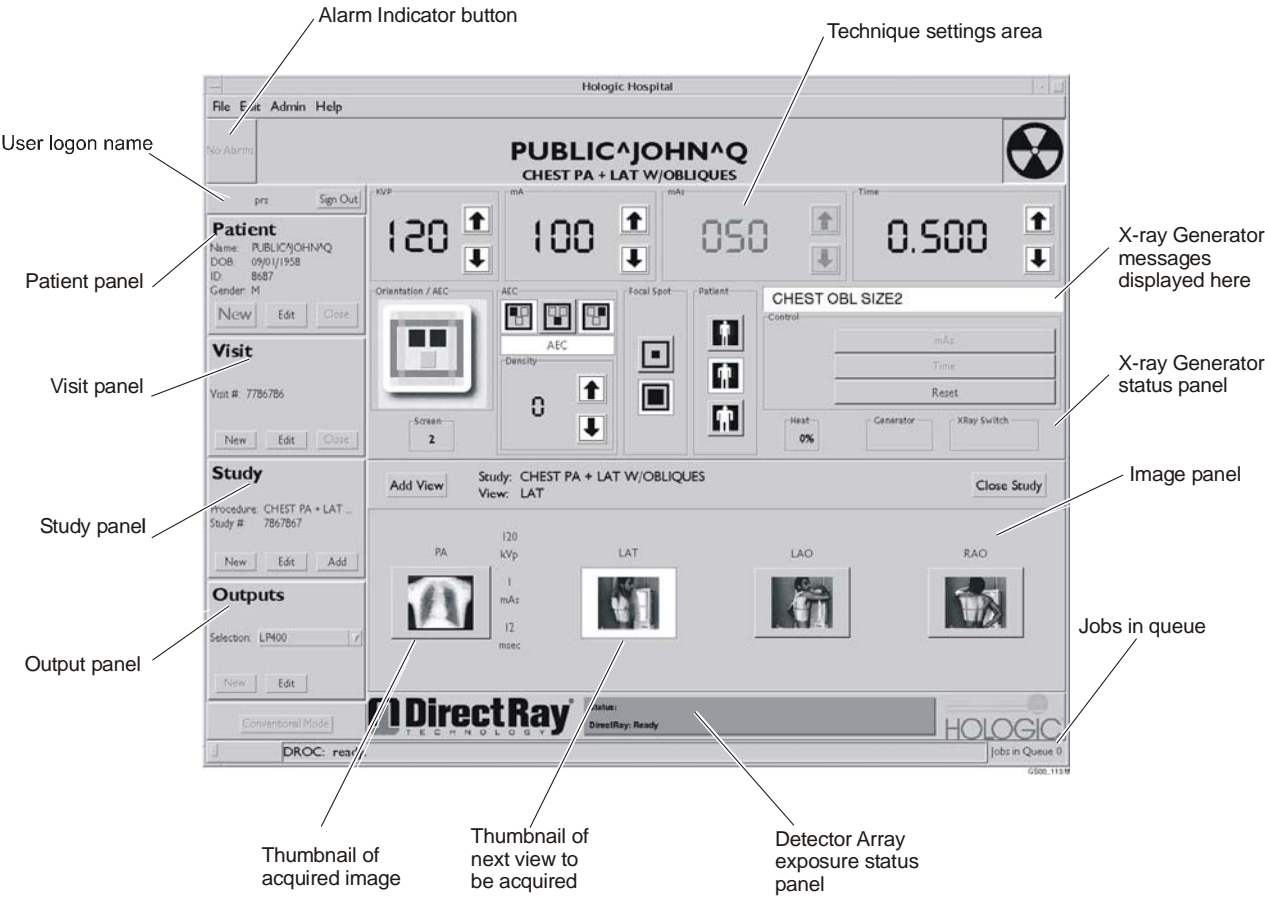
Study ID	Performed Procedure Step ID	Procedure Description	Status
55555555	44	SKULL 4 VIEWS ROUTINE	Scheduled
55555556	26	FACIAL BONES	Scheduled

Below the table is a large empty area. To the right of the table are navigation buttons: "first", "prev", "next", and "last". At the bottom right, it says "Jobs in Queue 0". The bottom status bar indicates "MC00\_410.tif".

If multiple procedures are listed under one patient, click on the appropriate procedure(s) and click the **Select** button. To cancel and return to the search screen, click the **Close** button in the patient option box.

Unless you want to change the procedure from the default one(s) displayed in the Study panel, go to the topic “Step 2: Choosing Output Destinations” on page 2-29.

If you want to change the procedure, refer to the topic “Step 8: Opening an Additional Procedure (Optional)” on page 2-54.



MC20\_306.cdr

## Choosing a Patient Using the Modality Worklist Query

The DirectRay Console application includes an optional feature—Modality Worklist—that allows you to retrieve patient information from a Radiology Information System (RIS). This feature follows the DICOM Modality Worklist standard, and requires your facility to have a DICOM Modality Worklist provider.

If this feature is configured on your system, the **Enter or search for patient** window contains an enhanced user interface that includes two tabs:

- **Worklist tab.** This tab includes two subtabs. The **Patient Query tab** allows you to search for a patient in the Modality Worklist provider using several different search criteria. The **Todays Worklist tab** allows you to retrieve a daily worklist of patients and visits from the RIS.
- **Local DB.** This tab allows you to manually enter patient information, or search the local database for a patient or visit. This tab functions as described in the topics “Adding a New Patient Manually” on page 2-13 and “Choosing an Existing Patient or Visit Using the Search Function” on page 2-15.

The enhanced **Enter or search for patient** window is shown below.

File Edit Admin Help

No Alarms

prs

Sign Out

Patient Name

Patient ID

Visit

Enter Patient Name (\* to search):

Search

Search Results:

Select

Name	ID	Sex	DOB
------	----	-----	-----

↑

first

↑

prev

↓

next

↓

last

Patient

Name:

DOB:

ID:

Gender:

New

Edit

Close

Visit

Visit #:

New

Edit

Close

Study

Procedure:

Study #:

New

Edit

Add

Outputs

Selection: no outputs

New

Edit

Conventional Mode

DROC: ready.

Jobs in Queue 0

MC00\_153.11

### **Retrieving Patient Records from the Modality Worklist Provider**

You retrieve patient records from the Modality Worklist provider by using search criteria to query the Modality Worklist provider. In response, the Modality Worklist provider returns the patients that match the search criteria. You then choose the patient and study whose images you want to acquire. The Patient Query is useful when searching for a specific patient or study.

The patient search criteria that can be used includes patient name, patient ID, study ID (for example, an accession number), Requested Procedure ID, and/or order date. Any combination of these criteria can be used for any given query.

***Note:** The query fields are configurable and are named per the criteria for your specific facility.*

**To query the information system for a patient,** choose the Worklist tab, then choose the Patient Query tab. Enter the following search criteria, in any combination:

- **Patient ID.** The Patient ID must be an exact match.
- **Patient Name.** You can enter the entire name, or use the asterisk (\*) as a wildcard character to specify only a portion of the name. Follow the same text entry guidelines as described previously under “Choosing an Existing Patient or Visit Using the Search Function.”
- **Study ID (Accession Number in the sample window).** The study ID number must be an exact match.
- **Requested Procedure ID (not applicable for all installations).** This ID must be an exact match.
- **Date Range.** Choose a date range from the **Date** drop-down list. The **within 3 days** date range option includes the 3 days prior to and 3 days following today. The other **within** options behave similarly. Note that when you return to the Patient Query window after completing exams, the Date range always reverts to **today**.

***Note:** In addition to the specific search criteria you enter, the chosen **Date Range** criteria always applies to the query. Ensure that the date the patient's exam(s) were ordered is included in the Date range field before initiating a query.*

When you are finished entering the search criteria, click the **Query** button or press the Enter key. The list of patients matching the search criteria displays, as shown in the sample window on the next page. In this example, the search criterion **PUB\*** was entered in the Patient Name field.

To navigate through a list that is too long to be entirely displayed, refer to the topic “Choosing an Existing Patient or Visit Using the Search Function” on page 2-15.

File Edit Admin Help

No Alarms

prs Sign Out

Patient

Name:  
DOB:  
ID:  
Gender:

New Edit Close

Visit

Visit #:

New Edit Close

Study

Procedure:  
Study #:

New Edit Add

Outputs

Selection: Drystar

New Edit

Conventional Mode

Hologic Hospital

Enter or search for patient

Worklist Local DB

Patient Query Todays Worklist

Patient ID Patient Name Accession Number Date

today

Query

Status: Query complete: 3 results

Patient ID	Patient Name	Sex	Date of Birth	Accession Number
289	DAVID^PUBLIC^Q	M	19300315	166
288	JANE^PUBLIC^Q	F	19800910	165
287	JOHN^PUBLIC^Q	M	19640401	164

first

prev

next

last

Jobs in Queue 0

MC00\_164.tif

### Viewing Patient Entries in “Today’s Worklist”

Today’s Worklist is useful if you prefer choosing patients or studies from a list of scheduled studies for the day.

**To retrieve all patient studies scheduled for today**, choose the Worklist tab, then choose the Today’s Worklist tab. The list of patient studies that have been ordered for today’s calendar day displays, as shown in the sample window below.

**To update the list**, if you would like to query the Modality Worklist provider for studies that have been ordered since the last list update, click the **Update** button. An updated list of patients and studies displays.

The DirectRay Console may occasionally perform scheduled queries in the background. **To refresh the list to see possible new entries**, click the **Refresh** button.

Hologic Hospital

File Edit Admin Help

No Alarms

Sign Out Worklist Local DB

## Enter or search for patient

pr

**Patient**

Name:  
DOB:  
ID:  
Gender:

New Edit Close

**Visit**

Visit #:

New Edit Close

**Study**

Procedure:  
Study #:

New Edit Add

**Outputs**

Selection: Drystar

New Edit

Conventional Mode

Patient Query Today's Worklist

Date:  
today

Refresh Update

Status: Query complete: 3 results

Patient ID	Patient Name	Accession Number	Date of Birth	Sex	Admission ID
289	DAVID^PUBLIC^Q	166	19300315	M	5551214
288	JANE^PUBLIC^Q	165	19800910	F	5551213
287	JOHN^PUBLIC^Q	164	19640401	M	5551212

first  
prev  
next  
last

Jobs in Queue 0

GS00\_134.tif

## Reordering and Resizing Columns in the Entry List

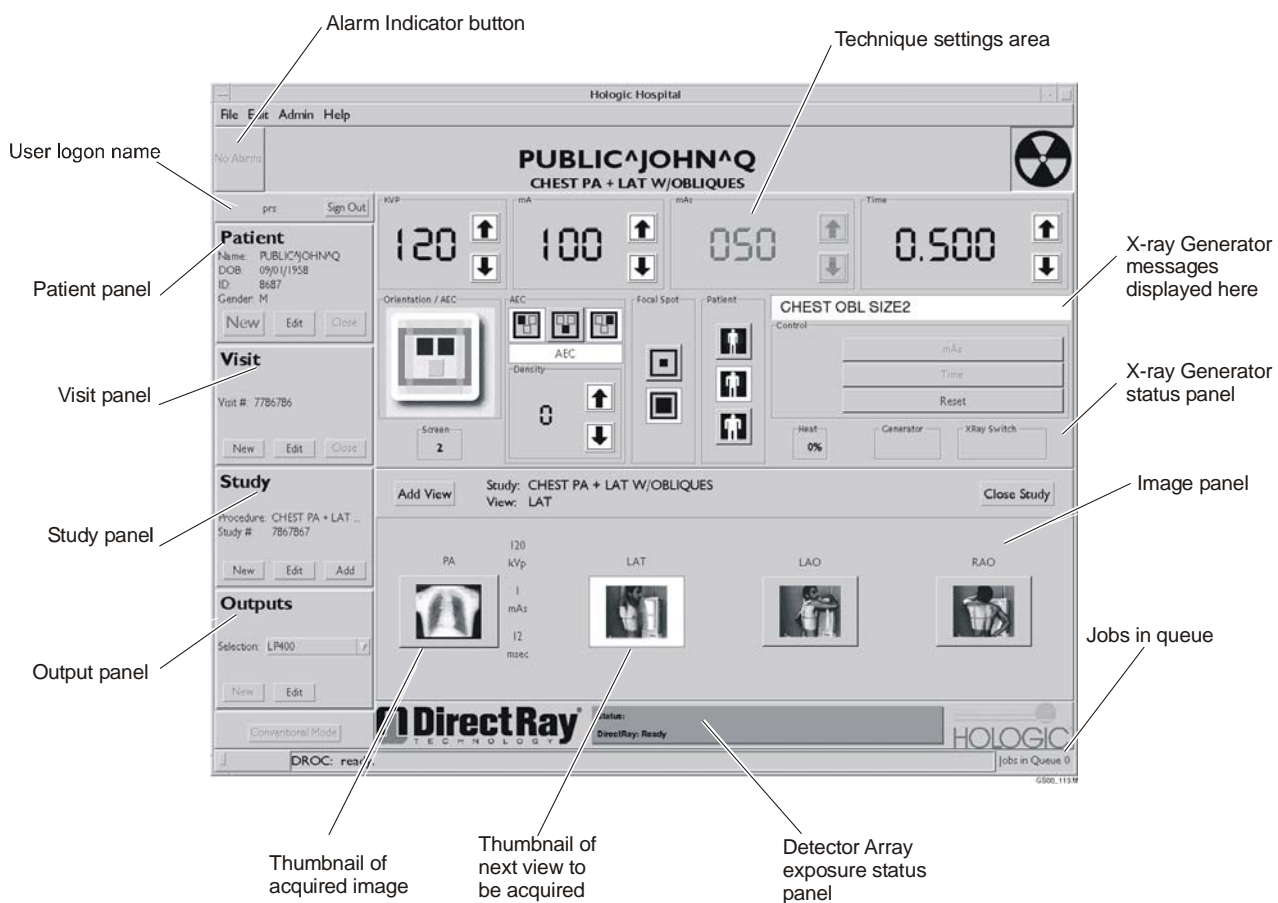
You can reorder or resize the columns in the patient entry list in the Worklist tab.

**To reorder the columns**, click and drag the column heading cell to the left or right, then release the mouse button when at the desired location.

**To resize a column**, move the pointer over one of the border lines of the column until it turns to a bidirectional handle icon. Click and drag the resize handle, then release the mouse button when at the desired width.

## Opening a Patient/Study in the Entry List

**To open a patient/study listed in the Worklist tab's entry list**, click on the entry. That patient, visit, and study are opened in the main window, as shown below.



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### ***Required Fields for Worklist-Ordered Studies***

The DirectRay Console is customized at the time of each site installation to require certain patient and order-related information before acquiring the patient images can proceed. Occasionally, all the required patient and study information is not sent from the Modality Worklist provider to the DirectRay Console as part of the query.

In that case, you are presented with an Edit Patient, Visit, or Study window, prompting you to enter the missing information. An example of the Edit Study window is shown below. In the example, a Study ID has been configured as a required value, but no value was received in the patient query from the Modality Worklist provider.

Edit Study

SMITH^JOHN^A

\*Study Id:

\*Procedure Description:

\*Accession #:

\*NOTE: Fields with an asterisk \* are mandatory and require input.

GS00\_047.tif

Enter the required information, modify the Procedure Description if needed, then click the **Accept** button to proceed.

For more procedures about how to edit patient, visit, or study information in these windows, refer to Chapter 3 in the *DirectRay Console User's Guide*.

## Scanning a Bar Code to Identify the Patient/Visit/Study



### WARNING

The bar code scanner is a Class II laser device. Do not use it in a patient contact area.

Laser light is emitted from the bar code scanner aperture. Avoid exposure. Do not stare into the beam.

For more information about using the bar code scanner and safety precautions, refer to the bar code scanner's original manufacturer documentation.

When you scan a bar code to uniquely identify a patient/visit/study:

- *If your site supports a connection to a Hospital Information System, Radiology Information System, or other remote patient database (for example, using a Modality Worklist provider), the DirectRay Console user application queries that database and the local DirectRay Console patient database for the ID.*
- *If your site does not support such a remote database connection, the DirectRay Console user application searches its local patient database for the ID.*

***If the scanned ID is not found,*** you must manually add the patient/visit/study. Refer to the topic “Adding a New Patient Manually” on page 2-13.

***If the scanned ID is found,*** the DirectRay Console application “opens” that patient and visit in the application’s main window, as shown on the following page.

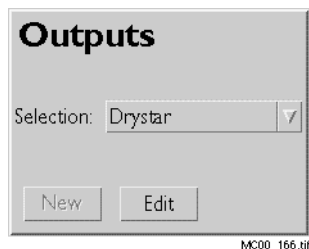
You are ready to choose to which output devices you want to send the images. Unless you want to change the procedure (that is, the series of images to be captured) from the default one displayed in the Study panel, go to the topic “Step 2: Choosing Output Destinations” on page 2-29. If you want to change the procedure, refer to the topic “Opening a New Study” in Chapter 3 in the *DirectRay Console User's Guide*.

**Note:** Patient records are kept temporarily in a local database, storage space availability permitting, to save you from having to reenter information for a patient who was recently X-rayed.

**Note:** If any required patient/visit/study information was not included in the information retrieved, the appropriate Edit Patient, Visit, or Study window displays, so that you can enter the missing required information. Refer to Chapter 3 in the DirectRay Console User's Guide for more information about how to edit patient, visit, or study information.

## Step 2: Choosing Output Destinations

Before you acquire patient images, you need to choose the output setup you want to use.



**To choose an output setup**, choose it from the **Selection** pop-up menu in the Outputs panel. The pop-up menu lists all of the output setups that have been created for your site.

## Step 3: Adjusting Exposure Settings and the Exposure Sequence (Optional)

At the time the system is installed, default exposure settings and imaging sequences are configured for each view in each available procedure. You can use manual techniques or phototiming techniques to adjust the default exposure settings.

Typically, you simply use the default settings. You would only change them for special circumstances, such as a very small person or a missing lung.

If you want to adjust the exposure settings, refer to the topic “Adjusting Technique Settings” in Chapter 3 in the *DirectRay Console User's Guide*. If you want to adjust the exposure sequence, refer to the topic “Working with Procedures in Chapter 3 in the *DirectRay Console User's Guide*.

When you have finished adjusting exposure and sequence settings, you are ready to position the patient and acquire images.

## Step 4: Adjusting the Orientation of the Table and Bucky

You can now position the radiographic table and Bucky to accommodate the orientation of the patient for the exposure.

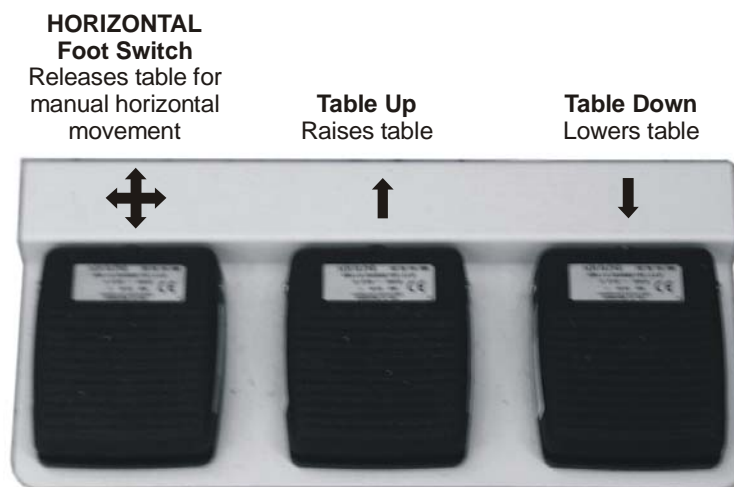
Refer to the following topics.

### Positioning the Radiographic Table

Use the multi-axis foot switch controls, shown in Figure 2-4, to position the table in the following ways:

- Move the table horizontally
- Raise or lower the table

**Figure 2-4.**  
Multi-axis Foot Switch  
Table Controls



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TM20\_066.cdr

For complete instructions on how to operate the radiographic table, refer to the *EPEX Radiographic Table User's Guide*.

## Positioning the Bucky

Use push buttons located on the Bucky handle, arm handle, and tower handle to release the brakes on the various joints of the articulating arm, freeing the Bucky and Bucky tower for repositioning. Also, to assist you in positioning the Bucky into standard positions, mechanical detents are incorporated into the articulating arm joints.

Each brake release push button is a momentary switch. Brakes are deactivated for as long as you depress the corresponding release switch.

With the articulating arm brakes released, you perform all Bucky movements manually. For complete details on the Bucky controls and procedures, refer to the *EPEX Radiographic Table User's Guide*.

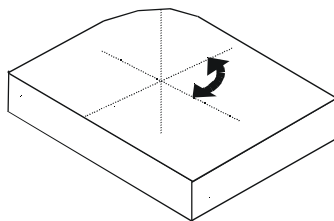
You can position the Bucky in the following ways:

- Pivot the Bucky between portrait and landscape
- Pivot the Bucky between upright and horizontal positions
- Raise or lower the Bucky
- Move the Bucky longitudinally along the table
- Rotate the Bucky around the articulating arm

### ***Rotating the Bucky Between Portrait and Landscape***

Figure 2-5 shows the controls you use to rotate the Bucky between portrait and landscape orientations.

**Figure 2-5.**  
Portrait/Landscape  
Release Button



To rotate the Bucky between portrait and landscape orientations...



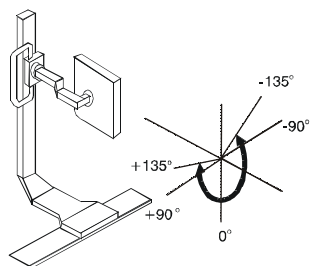
...press one of these release buttons on the sides of the Bucky

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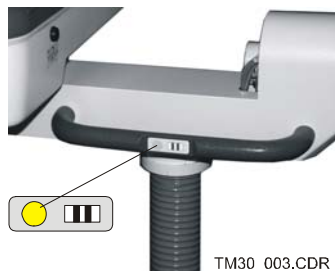
### ***Pivoting the Bucky Between Upright and Horizontal***

Figure 2-6 shows the controls you use to pivot the Bucky between upright and horizontal orientations.

**Figure 2-6.**  
Upright/Horizontal  
Release Button



To rotate the Bucky between horizontal and upright positions...



...press the yellow release button

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TM20\_062.cdr

### ***Raising or Lowering the Bucky***

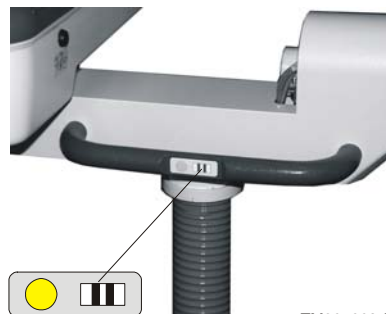
Figure 2-7 shows the controls you use to raise and lower the Bucky.

**Figure 2-7.**  
Vertical Release Button

To move the Bucky vertically...



...press this release



...or press this release

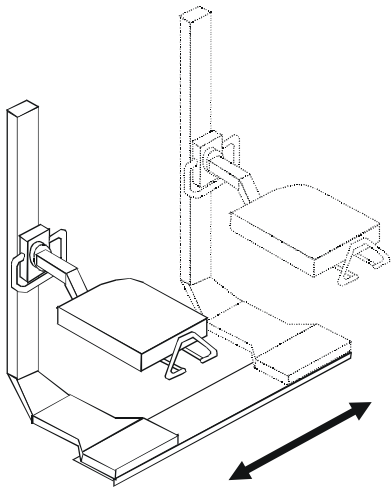
TM30\_006.CDR  
TM30\_008.CDR

TM20\_064.cdr

**Moving the Bucky Longitudinally**

Figure 2-8 shows the controls you use to move the Bucky longitudinally along the table.

**Figure 2-8.**  
Longitudinal Release  
Buttons



To move the Bucky longitudinally along the table...



...press this release on the  
Bucky handle

OR



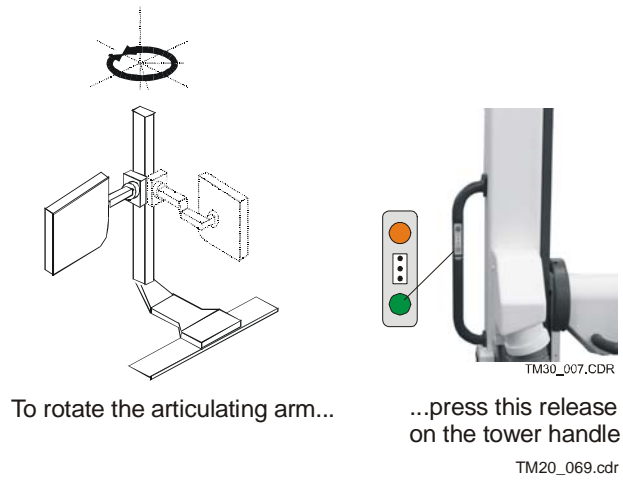
...press this release  
on the tower handle

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### ***Rotating the Articulating Arm***

Figure 2-9 shows the controls you use to rotate the Bucky's articulating arm.

**Figure 2-9.**  
Arm Rotation Release

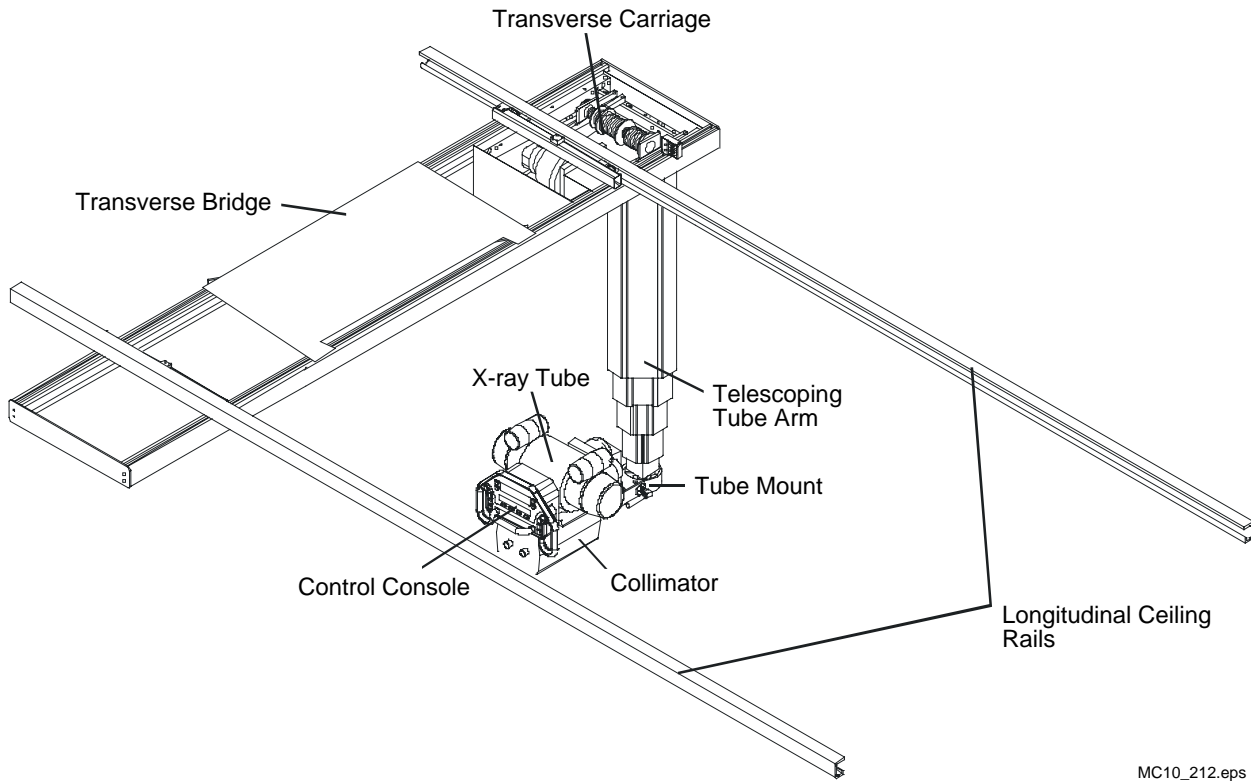




## Step 5: Positioning the X-ray Tube and Collimator

You position the X-ray tube and Collimator by moving the Overhead Tube Crane, from which they are suspended. The Overhead Tube Crane consists of longitudinal rails, a transverse bridge, a transverse carriage and telescoping column, and a control console. Refer to Figure 2-10.

**Figure 2-10.** Omniflex IV Overhead Tube Crane



## Features

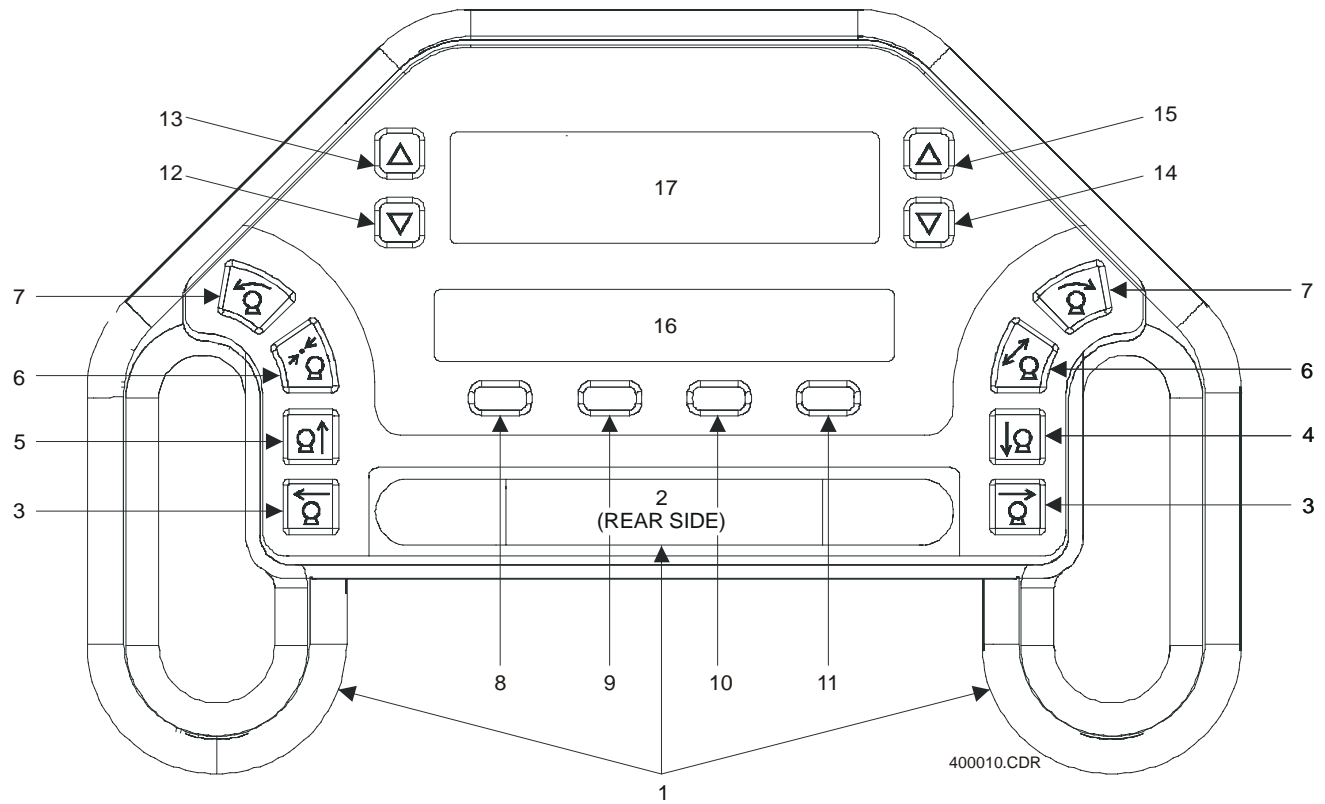
The features of the Omniflex IV overhead tube crane include:

- Digital height readout indicating the focal film distance either to the Bucky, table top, or floor
- Digital angulation readout
- Easy-Touch dome switches
- Clear, unobstructed viewing and access to Collimator controls and indicators
- Built-in lateral CABL-TRAC™ for concealed support of high-voltage cables
- Rotational tube movement
- Full field travel and coverage of tube support allows maximum use of available room space
- Positive stops at 0° and 90° to aid in aiming the beam for use with the Bucky

## Using the Overhead Tube Crane Control Panel to Position the X-ray Tube

You position the X-ray tube by pressing one of the release buttons on the overhead tube crane's control panel, moving the X-ray tube arm to the desired position, then releasing the button to lock the crane into place.

Figure 2-11 shows the control panel. The functions of the control panel are described in Table 2-1 on page 2-38.

**Figure 2-11. Omniflex IV Control Console****Notes:**

1. All directions for use of the EPEX-Omniflex tube crane are described from the point of view of a user standing in front of the tube crane.
2. The system's layout may alter the meaning of some directions. For example, in Wall Mode Configurations A and C, the lateral center position for the tube crane is in the tube crane's transverse direction; in Wall Mode Configuration B, the lateral center position for the tube crane is in the tube crane's longitudinal direction. The meanings of control console soft-keys and LEDs change accordingly.
3. Unless noted otherwise, the LED above the soft-key indicates the lock status: ON = locks active, OFF = locks released.
4. A flashing LED generally indicates a function that needs to be performed to comply with required conditions

**Table 2-1.** Omniflex IV Control Panel Component Descriptions**Figure 2-11**

Callout Number	Control Component	Description
1	Handles	The control panel has three handles—two on either side and one at the center below the panel.
<i><b>Note:</b> Unless noted otherwise, the LED above the soft-key indicates the lock status: ON = locks active, OFF = locks released.</i>		
2	All Locks Release Grip Switch	<p>Squeeze this grip switch, located at the rear of the center handle, to release the lateral, longitudinal, and vertical locks and manually position the tube crane.</p> <p>To lock the tube crane in the current position, release this switch.</p> <p>When squeezed, this switch stops all automatic motions and turns Auto mode off, if it was on.</p>
3	Longitudinal Lock Soft-Key	Pressing either soft-key releases the longitudinal lock, allowing you to manually move the tube crane longitudinally.
<i><b>Note:</b> With Auto Mode engaged, the longitudinal lock is automatically applied when either the lateral center or SID position(s) is reached. This function is dependant upon the Wall Mode position for which the room is configured.</i>		
4	Down soft-key	<p>This soft-key activates the drive motor and moves the telescopic arm down. While the arm is moving down, its associated LED flashes.</p> <p>To release the vertical lock and move the tube crane up and down manually, press the Down and Up soft-keys simultaneously.</p> <p>Pressing this soft-key while Auto mode is on turns Auto mode off.</p>
5	Up soft-key	<p>This soft-key activates the drive motor and moves the telescopic arm up. While the arm is moving up, its associated LED flashes.</p> <p>To release the vertical lock and move the tube crane up and down manually, press the Down and Up soft-keys simultaneously.</p> <p>Pressing this soft-key while Auto mode is on turns Auto mode off.</p>
6	Transverse Lock Soft-Keys	Pressing either soft-key releases the transverse locks, allowing you to manually move the tube crane transversely.
<i><b>Note:</b> The transverse lock is automatically applied when either the lateral center or SID position(s) is reached. This function is dependant upon the Wall Mode position for which the room is configured.</i>		

**Table 2-1.** Omniflex IV Control Panel Component Descriptions

<b>Figure 2-11</b>		
<b>Callout Number</b>	<b>Control Component</b>	<b>Description</b>
7	Angulation Lock Soft-keys	Pressing either soft-key releases the angulation lock, allowing you to rotate the X-ray tube about the horizontal axis.  Press both angulation soft-keys simultaneously to release all locks (vertical, angulation, longitudinal and lateral) so that you can manually move the tube crane in all available directions and orientations. However, pressing both soft-keys simultaneously while Auto mode is on, will turn Auto mode off.
8		Not Used
9	Auto Mode soft-key	This soft-key toggles between auto and manual mode, as described below. The current setting is shown just above the soft-key in the status display called out by number 16 in Figure 2-11 on page 2-37.
	Table Mode (Auto Off)	Use this setting when in Table mode and you want to manually position the X-ray tube vertically to establish the SID.
	Table Mode (Auto On)	Use this setting when in Table mode and you want the X-ray tube to automatically track the Bucky's vertical motion, maintaining the predetermined SID (a vertical SID of either 40 in. or 44 in. can be set during calibration).
	Wall Mode (Auto Off)	Use this setting when in Wall mode and you want to manually position the X-ray tube vertically to align it with the Bucky.
	Wall Mode (Auto On)	Use this setting when in Wall mode and you want to have the X-ray tube automatically align itself vertically with the Bucky.
10, 11		Not Used
12, 13, 14, 15		Used only during the EPEX-Omniflex Software Calibration procedure.
16	Status Display	The status display relays pertinent information to the user. Such information as current SID in units of inches or centimeters (in/cm), Auto Mode status, positioning information, and system ready status are displayed in this window.
17	Angulation Display	The right side of this display shows the current tube angle in angular degrees, with 0° indicating the vertical direction and 90° the horizontal direction.

## Using the Auto Modes to Have the X-ray Tube Track the Bucky

When Auto mode is installed, the tube crane is equipped with a motorized vertical drive. There are two different AUTO modes available and the tube crane can be configured as follows: Auto-wall, Auto-table, both, or neither. The Auto option allows automatic tracking of the tube to the Bucky (Wall Auto) or with the table top (Table Auto).

Selection of the desired Auto option is accomplished by pressing the Mode soft-key (callout 10 in Figure 2-11 on page 2-37) so that the Auto indicator is illuminated. The tube must be angulated correctly for the desired Auto option to be active. Angulation of the tube to  $90 \pm 15^\circ$  towards the Bucky with the Bucky in the upright (vertical) position automatically places the tube crane in Auto-wall mode. If the tube is outside the  $0 \pm 15^\circ$  window, the tube crane is in Auto-table mode.



**Prior to selecting Wall Auto mode, the Bucky must be positioned to a height above the table top; otherwise, the automatic positioning may drive the tube into the table top or the patient until the safety clutch stops vertical motion (set at 40 lb or 18.14 kg).**

### Auto Mode Option

The Omniflex can be configured with or without the Auto Tracking option. The Auto Tracking option allows automatic vertical tracking of the X-ray tube to the Bucky. Refer to the topic “Positioning the Overhead Tube Crane for Chest Exposures” on page 2-43 or “Positioning the Overhead Tube Crane for Under Table Exposures” on page 2-44 for instructions on turning Auto Mode on.

## Auto On In Wall Mode

With Auto on in Wall mode, the Omniflex continually drives the tube up or down to maintain alignment of the X-ray field and the Bucky. **It is important to remember that the operator moves the Bucky to the desired height, and the X-ray tube follows, not the other way around.**

In Auto mode, the system suspends automatic vertical tracking for the duration of the occurrence of any of the following conditions:

- The X-ray tube is not in Wall mode lateral center.
- The Bucky horizontal centerline has been raised or lowered beyond the tube crane's limit of travel.
- The Bucky is not in the +90° (vertical) position.
- The SID is not 40 in. or 72 in.

Tracking automatically resumes as soon as all of the above conditions are no longer in effect.

The system automatically turns off Auto mode upon the occurrence of any of the following events:

- The Lateral Center function is turned off.
- The Left or Right soft-key is pressed, releasing the longitudinal lock.
- Any manual vertical motion control is activated, whether activating the drive motor or not.
- Any manual multi-axis motion control is activated.

If Auto mode turns off automatically, the operator must press the Auto Mode soft-key to turn it back on.

The following messages display on the Omniflex front panel when operational requirements are not met:

- **IN MOTION.** Indicates that the tube is in motion, aligning itself with the Bucky.
- **HORIZ SID?** A prompt instructing the operator to position the tube at the selected horizontal SID.
- **BUCKY? LAT CNTR?** Indicates that the Omniflex is not at Wall mode lateral center or that the Bucky is not vertical.
- **READY.** Indicates that all positioning requirements are met.

## Auto On In Table Mode

With Auto on in Table mode, the Omniflex drives the telescopic tube-arm vertically to maintain a 40 in.SID with the Bucky in the 0° position (horizontal). **It is important to remember that the operator positions the table to the desired height, and the X-ray tube follows, not the other way around.**

In Auto mode, the system suspends automatic tracking for the duration of the occurrence of any of the following conditions:

- The X-ray tube is not in Table mode lateral center.
- The Bucky has been raised or lowered to a point such that maintenance of the specified SID would take the tube crane beyond its limit of travel.
- The Bucky is not in the 0° (horizontal) position.

Tracking automatically resumes as soon as all of the above conditions are no longer in effect.

The system automatically turns off the Auto mode upon the occurrence of any of the following events:

- The Lateral Center function is turned off.
- The Left or Right soft-key is pressed, releasing the longitudinal lock.
- Any manual vertical motion control is activated, whether activating the drive motor or not.
- Any manual multi-axis motion control is activated.

If Auto mode turns off automatically, the operator must press the Auto Mode soft-key to turn it back on.

The following messages display on the Omniflex front panel when operational requirements are not met:

- **IN MOTION.** Indicates that the tube is in motion and has not stopped at the 40 in. vertical SID position.
- **BUCKY? LAT CNTR?** Indicates that the Omniflex is not at Table mode lateral center or that the Bucky is not horizontal.
- **READY.** Indicates that all positioning requirements are met.



## Positioning the Overhead Tube Crane for Chest Exposures

To position the overhead tube crane for chest or other upright exposures:

Step	Action
1	Move the Bucky tower all the way to the left.
2	Position the Bucky Stand arm at 135°.
3	Rotate the Bucky to the vertical position (Bucky's 90° switch ON).
4	Raise the Bucky to the proper height.
5	Ensure that the Bucky is in Portrait or Landscape orientation, not an intermediate orientation.
6	Rotate the X-ray tube/Collimator to the 90° position, facing the Bucky.  <i><b>Note:</b> The Omniflex automatically enters Wall mode whenever the angulation of the X-ray tube is 90° ±15° clockwise (horizontal, X-rays aimed left) or counterclockwise (horizontal, X-rays aimed right).</i>



Prior to selecting Auto when in Wall mode, the Bucky must be positioned to a height above the table top; otherwise, the automatic positioning may drive the tube into the table top or patient, until motor torque is exceeded (set at 40 lb or 18.14 kg).

Step	Action
	<b>To use the Auto Mode:</b>  <i><b>Note:</b> The Omniflex must be equipped with the Auto Tracking option.</i>
7	To turn on Auto mode, press the Auto Mode soft-key.
8	To turn on Lateral Center, press the Lateral Center soft-key.  <i><b>If the message BUCKY? LAT CNTR? flashes on the Omniflex front panel display,</b> move the tube crane to Wall mode lateral center.</i>  <i><b>If the message HORIZ SID? flashes on the Omniflex front panel display,</b> position the X-ray tube at one of the predetermined horizontal SIDs (40 in. or 72 in.) and verify that the SID is displayed on the Omniflex front panel display.</i>  <i><b>Note:</b> In Auto mode, the X-ray tube must reach vertical alignment with the center of the Bucky before exposure is enabled.</i>



Step	Action
9	<p><b>To use the Automatic Collimation mode:</b></p> <p>Ensure that the angulation of the X-ray tube is <math>90^{\circ} \pm 2^{\circ}</math>, facing the Bucky.</p>

## Positioning the Overhead Tube Crane for Under Table Exposures

To position the overhead tube crane for under table exposures:

Step	Action
1	Rotate the Bucky to the horizontal position (Bucky $0^{\circ}$ SW is "ON").
2	Position the Bucky Stand's arm at $0^{\circ}$ .
3	Ensure that the Bucky is in Portrait or Landscape orientation, not an intermediate orientation.
4	<p>Rotate the X-ray tube to <math>0^{\circ}</math>.</p> <p><i><b>Note:</b> The Omniflex automatically enters Table mode whenever the angulation of the X-ray tube is <math>0^{\circ} \pm 15^{\circ}</math> (X-rays aimed vertically downward).</i></p> <p><b>To use Auto mode:</b></p> <p><i><b>Note:</b> The Omniflex must be equipped with the Auto option.</i></p>
5	To turn on Auto mode, press the Auto Mode soft-key.
6	<p>To turn on Lateral Center, press the Lateral Center soft-key.</p> <p><i>If the message BUCKY? LAT CNTR? flashes on the Omniflex front panel display, move the tube crane to Table mode lateral center.</i></p>
7	<p>Verify that the 40 in. SID is displayed on the Omniflex front panel display.</p> <p><b>To use the Automatic Collimation mode:</b></p>
8	<p>Ensure that the angulation of the X-ray tube is <math>0^{\circ} \pm 2^{\circ}</math> (vertical).</p> <p><i><b>Note:</b> When Auto is off in Table mode, the differential SID between the X-ray tube and Bucky appears on the Omniflex front panel display.</i></p>

## Adjusting the Collimator

Use the Collimator shutter to help you aim and size the X-ray exposure area:

- To ensure that the tube is aimed properly, project a light through the shutter to illuminate a target area on the patient.
- To control the area size of the exposure on the patient, adjust the height and width of the shutter opening.

For more information on Collimator adjustments, refer to the *Linear IV Collimator Installation, Operation, and Maintenance Manual*.

## Step 6: Exposing Patients

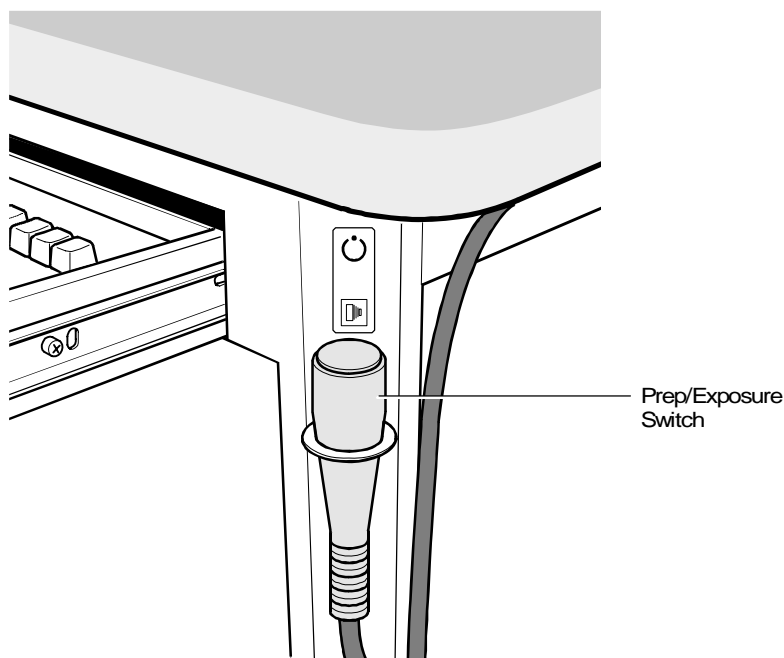


### WARNING

This X-ray unit may be dangerous to the patient and operator unless safe exposure factors and operating instructions are observed.

Patient exposure is controlled by a 2-position button switch on the side of the DirectRay Console, as shown in Figure 2-12.

**Figure 2-12.**  
DirectRay Console  
Prep/Exposure Switch



**RIGHT SIDE**

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When the prep button is pressed half way, you have 30 seconds to complete the exposure.

When the prep button is pressed all the way, the exposure is taken within one half second.


**Note:** Releasing the Prep/Expose button before the exposure is completed causes premature and immediate termination of the exposure. This may cause the X-ray Generator Reset button on the DirectRay Console application's main window to light. To perform subsequent exposures, click the **Reset** button.

**Note:** If the X-ray tube heat units exceed the maximum allowable limit, the X-ray tube and Generator are disabled until the heat units drop to a safe level. If this condition occurs, a message displays and an audible beep sounds.

The Status indicator on the DirectRay Console application's main window displays a message to indicate when the DirectRay Detector is ready for the next exposure:

- A **Wait countdown** indicates that the DirectRay Detector is refreshing for the next exposure. This countdown occurs only when the DirectRay Detector has been recently powered up, or if an exposure has been aborted.
- **Ready to expose** indicates that the DirectRay Detector is ready to capture an exposure.

#### To acquire an image:

Step	Action
1	<p>Wait until the Status indicator reads <b>DirectRay: Ready</b> (green background).</p>  <p><i>Note:</i> The DirectRay Detector goes into "sleep" mode to save energy if it has not been used for a predefined period of time. Opening a patient record or running the tube warm-up "awakens" the DirectRay Detector. If this has happened, you might have to wait a few minutes for the DirectRay Detector to enter its ready state.</p>
2	Press the Prep/Expose button half way (to the second position) and hold.
3	Give the patient breathing and/or pre-exposure instructions.
4	<p>Press the Prep/Expose button all the way (to the second position) and hold.</p> <p>When the exposure occurs; the Status panel turns grey and a tone sounds.</p> <p><i>Note:</i> While behind the leaded wall when taking an exposure, you must maintain verbal communication with the patient and keep the patient within your sight at all times.</p>
5	After the tone stops, release the button.
6	Give the patient the appropriate breathing instructions.

When the exposure is complete, the Image Preview window opens and displays the image. Your customized windows may look different from the windows presented in this manual.

## Two-Stage Image Preview

Once the Preview Image window opens, the image displays in two stages to allow you to start reviewing and working with it:

- Initially, a low-resolution version of the image displays. The message “Loading image” indicates that the high-resolution image is still being processed.

With the low-resolution image displayed, you can perform any of the functions in the Image Preview window except changing the image appearance or accepting the image. This stage allows you enough time to determine whether the patient positioning is satisfactory and, if not, reject the image without having to wait until the high-resolution version is ready to display.

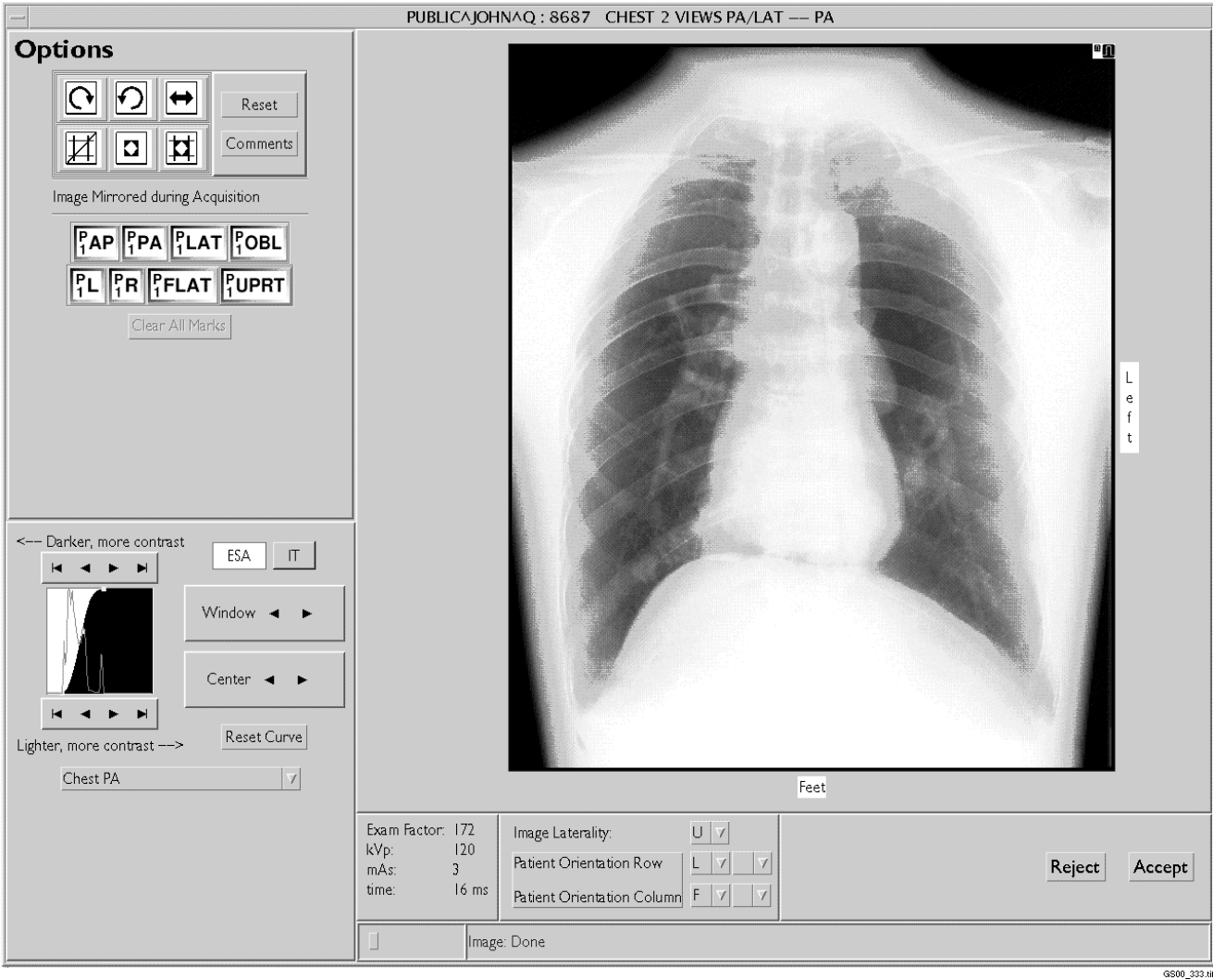
- After several seconds, the high-resolution version of the image displays. With this version displayed, all functions in the Image Preview window are enabled.

## Step 7: Accepting or Rejecting an Image

From the Image Preview window, you can perform the following tasks:

- Rotating or mirroring the image.
  - Verifying the assigned image laterality and patient orientation, and correcting them if necessary.
  - Cropping the image.
  - Selecting the sheet format and specifying the image cell on the sheet for the current image.
  - Using the True Size helper to ensure that the image can print at its actual size.
  - Using a mask to outline the image and make the area outside the mask black.
  - Adding markers to the image.
  - Selecting the ESA or IT image processing method.
  - Changing the look-up table (LUT) curve of the image to change its appearance.
  - Adding a comment to an image, which is sent with the image to DICOM workstations.
  - Accept the image as it is.
- OR*
- Reject the image.

The following topics explain how to perform these tasks. A sample of the Image Preview window is shown below.



**Rotating or Mirroring the Image (Optional)**

If required, you can rotate or mirror the image. For more information, refer to “Rotating the Image” and “Mirroring the Image” in Chapter 3 in the *DirectRay Console User’s Guide*.

## Verifying and Correcting Image Laterality and Patient Orientation Settings (Optional)

When an image is captured, it is assigned image laterality and patient orientation settings that are predefined for the selected view. You can change these settings from the default ones assigned. For more information, refer to “Verifying and Correcting the Image Laterality and Patient Orientation Settings in Chapter 3 in the *DirectRay Console User's Guide*.

## Cropping an Image (Optional)

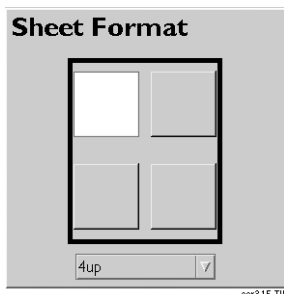
You can crop an image for output to a printer. The cropping applies only to the image when it is sent to a DICOM print or storage device.

For more information, refer to “Cropping and Image” in Chapter 3 in the *DirectRay Console User's Guide*.

## Selecting the Image Position on a Multiformat Sheet (Optional)

**Note:** Multi-format film will not automatically print until all the spaces are filled. If exam is finished, and all spaces are not filled, the film can be printed by clicking the *Close Study* button.

If the image is being printed on a multiformat sheet (that is, more than one image on the sheet), you must choose which position on the sheet to place the image. The Image Preview window includes a Format area that displays rectangles representing the chosen image placement format. A 4-up format is shown in the sample Format area below.



The default placement area on the sheet for the current image is indicated as a white rectangle. If other images have already been captured for the current sheet, their thumbnails are displayed in their chosen areas.

**Note:** If you choose one of the formats other than 1 up, use text-on-film instead of annotation boxes for any image-specific text you want printed under each image.

**To change the format,** choose another format from the drop-down list. Depending on the DICOM printer's capabilities, the available formats are:

- **1 up.** Only one image on the sheet. The default setting for output devices that do not support multiformatting.
- **2 up – 1 by 1.** Two images are placed side-by-side.
- **2 up – 1 over 1.** Two images placed one over the other.
- **4 up – 2 x 2.** Four images placed two over two.



Note that, if you change formats and your system has been set up with auto-cropping and the selected output device has the True Size option on, the image is automatically cropped so that it fits in its cell on the sheet. For more information, refer to “Selecting the Sheet Format” in Chapter 3 in the *DirectRay Console User's Guide*.

## Using True Size Helper (Optional)

When a sheet format is selected and the True Size option has been set for a destination printer, the True Size function calculates whether the image will fit on the specified format and displays crop marks to indicate what area of the image will be sent to the output device. For more information, refer to “Using the True Size Helper” in Chapter 3 in the *DirectRay Console User's Guide*.

## Masking an Image (Optional)

You can draw an irregular mask around the image. The area outside of the defined mask is converted to black. An auto-crop feature can also be used with the mask, automatically cropping the image to the perimeter of the mask. Masking and cropping apply only to the image when it is sent to a DICOM print or storage device.

For more information, refer to “Using a Mask to Outline the Image in Chapter 3 in the *DirectRay Console User's Guide*.

## Adding Markers to the Image (Optional)

You can add markers to an image that allow you to give further information about the image (for example, supine, upright, and so on), the markers are sent to any DICOM devices chosen as an output destination for the image.

For more information, refer to “Adding Markers to an Image” in Chapter 3 in the *DirectRay Console User's Guide*.

## Selecting ESA or IT (Optional)

The DirectRay Console supports both Exam-Specific Algorithm (ESA) and Inverse Topography (IT). For more information, refer to “Selecting ESA vs. IT Image Processing” in Chapter 3 in the *DirectRay Console User's Guide*.

## Changing the Appearance of the Image (Optional)

You can change the appearance of the image by:

- Adjusting the image's LUT settings manually by using the curve controls in the image processing panel. These adjustments effectively change the minimum density, maximum density, contrast, and brightness used for the image, thus changing the image appearance.
- Adjusting the image's LUT settings by placing the cursor on the LUT curve's handles, pressing and holding the right mouse button, and dragging the handle.
- Modifying an image's LUT by clicking and holding the right mouse button and moving the pointer over the image.
- Clicking on the pop-up menu in the image processing panel to change the anatomy-related LUT being used.

When the image is accepted, the image is saved as currently displayed. It is this version of the image that is sent to the output destinations. Note that, typically, LUT adjustments are not needed. For more information about making these appearance adjustments, refer to “Adjusting the LUT” in Chapter 3 in the *DirectRay Console User's Guide*.

## Adding Comments to an Image (Optional)

You can add text comments to an image at the time of acquisition; the comment is sent to any DICOM devices chosen as an output destination for the image.

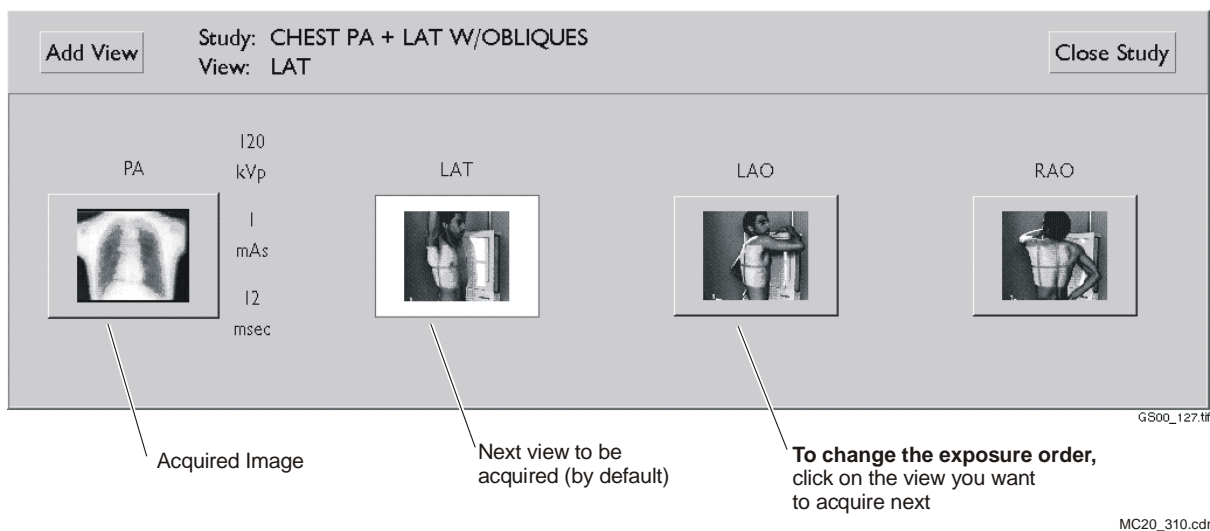
For more information, refer to “Adding Comments to an Image” in Chapter 3 in the *DirectRay Console User's Guide*.

## Accepting the Image

**Note:** Once the image is accepted, it cannot be moved to another image placement area.

**To accept the image**, click the **Accept** button (or press the Spacebar on the keyboard). The Image Preview window closes and a thumbnail (minimized view) of the image replaces the view figure in the Image Panel of the DirectRay Console application's main screen, as shown below. The exposure settings used to acquire the image are displayed next to its thumbnail.

Once accepted, that image is stored in the DirectRay Console and sent to the chosen output devices. You are now ready to acquire the next image in the procedure.



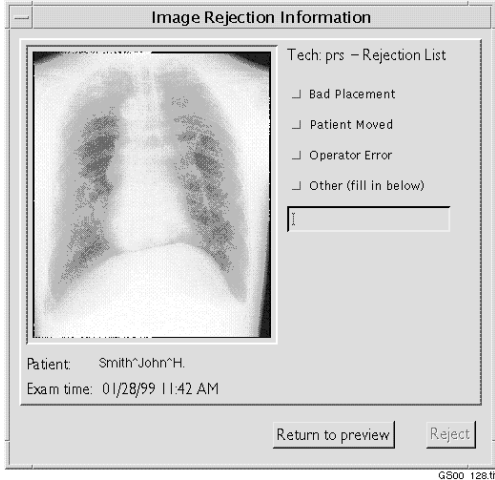
By default, the next view to be exposed is chosen in the image panel. If needed, you can choose a different view and adjust the exposure settings before acquiring the next image. For more information about these procedures, refer to Chapter 3 in the *DirectRay Console User's Guide*.

## Rejecting the Image

**Note:** Unless auto-cleanup of the reject bin has been configured, rejected images must be manually deleted by the system administrator; the system does not delete rejected images when it reclaims disk space.

You may want to reject an image (for example, if the patient moved during the exposure).

### To reject the image:

Step	Action
1	<p>In the Image Preview window, click the <b>Reject</b> button.</p> <p>The Image Rejection Information window displays, as shown below. In this window, you enter a reason for the rejection.</p> 
2	<p>Choose one or more reasons from the displayed list of default comments, and/or type in a reason.</p>
3	<p><b>To save the rejection reason and reject the image</b>, click the <b>Reject</b> button.</p> <p>The Rejection Reason and Image Preview windows close and you can then recapture the image.</p> <p><b>To dismiss the window and return to the Image Preview window without rejecting the image</b>, click the <b>Return to Preview</b> button.</p>

Rejected images are stored in a designated *reject bin* storage area in the DirectRay Console, and can be discarded or resent to an output device by users with administrative operating privileges.

## Step 8: Opening an Additional Procedure (Optional)

For a given study, you may want to open additional procedures, to include their images in the study.

For more information refer to the topic “Working with Multiple Open Procedures” under the topic “Working with Procedures” in Chapter 3 in the *DirectRay Console User's Guide*.

## Step 9: Adding a View to a Procedure (Optional)

If the current procedure does not include all the views you want to capture, you can add views to it.

For more information, refer to the topic “Adding a View to a Procedure” under the topic “Working with Procedures” in Chapter 3 in the *DirectRay Console User's Guide*.

## Step 10: Closing the Study, Visit, and Patient

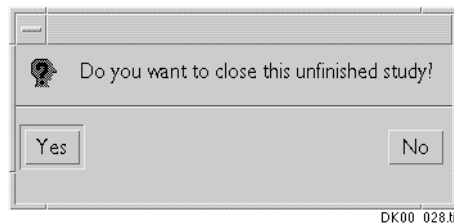
After acquiring all images for a study, you close the study. You can then open a new study for the same patient, open a new patient, choose another patient or visit, or log out of the session.

**Note:** When all images in a study have been acquired, the **Close Study** button displays in red.

You can also close a study even though you have not finished acquiring all of the required images (or have not acquired any images). You can reopen the study at a later time to complete it.

**To close a completed study**, from the DirectRay Console application's main screen, click the **Close Study** button. The main window clears, allowing you to add or choose the next patient.

**To close an incomplete study**, from the DirectRay Console application's main screen, click the **Close Study** button. You are prompted whether you want to close the study without finishing, as shown below.



**Note:** The fact that a study is incomplete does not prevent the patient record and associated images from being deleted as part of the system's storage space reclamation process. For more information about the reclamation, and how to protect a patient record and associated images from being deleted, refer to Chapter 4.

Click the **Yes** button to continue. The main window clears, allowing you to choose the next patient or visit with which you want to work.

**To close a visit**, click the **Close** button in the Visit panel.

**To close a patient**, click the **Close** button in the Patient panel.

## Step 11: Signing Out from an Acquisition Session

**Note:** You can sign out from an acquisition session with a procedure open. The procedure opens for the next user who signs on to a session.



**To sign out from the current DirectRay Console acquisition session,** from the main window click the **Sign Out** button. The Login window displays. For system security, the workstation display is locked at the Login window. In this state, a user can only log in to another session, and at the same user level (**tech** or **mgr**) of the previous user.


**If you click the Exit button, you must restart the DirectRay Console. This takes approximately five minutes.**



## Switching User Levels

To be able to sign in at a different user level—that is, switching between **tech** and **mgr**—you have to log out of the DirectRay Console application.

**To switch user levels:**

Step	Action
1	<p>From the <b>File</b> menu, choose <b>Exit</b>.</p> <p>The Exit from DROC window displays.</p> 
2	<p>Choose the <b>Log out of the computer?</b> option and click the <b>Yes</b> button.</p> <p>A dialog box displays asking you to confirm that you wish to log out.</p>
3	<p>Click the <b>Yes</b> button.</p> <p>The DirectRay Console application closes and the grey SUN Microsystems banner displays.</p>
4	<p>Log in at the desired user level using the procedure in the topic “Step 5: Logging In to the CPU’s Operating System” on page 2-6.</p>
5	<p>Log in with your name and password using the procedure in the topic “Step 6: Signing In to the DirectRay Console Application” on page 2-7.</p>

# Powering Down the System Components

Typically, you should leave the system components on. The DirectRay Console CPU, monitor, and DirectRay Detector enter energy-saving “sleep” mode when not used for a period of time.

If you have to power down the system, perform the steps outlined in the following topics.

## Recommended Power Down Procedure Overview

**To power down the system, it is recommended that you perform the power down tasks in the following sequence:**

Step	Action
1	Power down the DirectRay Console CPU.
2	Power down the X-ray Generator. This also typically powers down the other X-ray system components.
3	Power down the DirectRay Console's UPS, which in turn powers down the DirectRay Detector and DirectRay Controller.

The following topics provide instructions for performing each of these steps.



**CAUTION**

**The DirectRay Console CPU should be powered down once a day to ensure a complete system reset. If this is not done, system performance deteriorates.**




**CAUTION**

**In the *Admin* menu, the *Device Control* function has a selection called *DirectRay Power Off*. This does not turn off power to the X-ray tube arm, the Bucky, or the table, and should be used only when directed by a Del service representative.**



## Step 1: Powering Down the DirectRay Console CPU

**To power down the DirectRay Console CPU:**

Step	Action
1	<p>From the <b>File</b> menu, choose <b>Exit</b>.</p> <p>The Exit from DROC window displays.</p> 
2	Choose the <b>Power off the computer?</b> option.
3	<p><b><i>To continue with the power down</i></b>, click the <b>Yes</b> button.</p> <p>The system displays messages as it performs the operating system shutdown procedures. When the shutdown sequence completes, the CPU powers off and the monitor goes blank (the monitor enters an energy-saving “sleep” mode). Wait until the monitor goes blank before proceeding to “Step 2: Powering Down the X-ray Generator” on page 2-59.</p> <p><b><i>To cancel from the DirectRay Console application’s power down process</i></b> and redisplay the DirectRay Console application’s Login window, click the <b>No</b> button.</p>



**CAUTION**

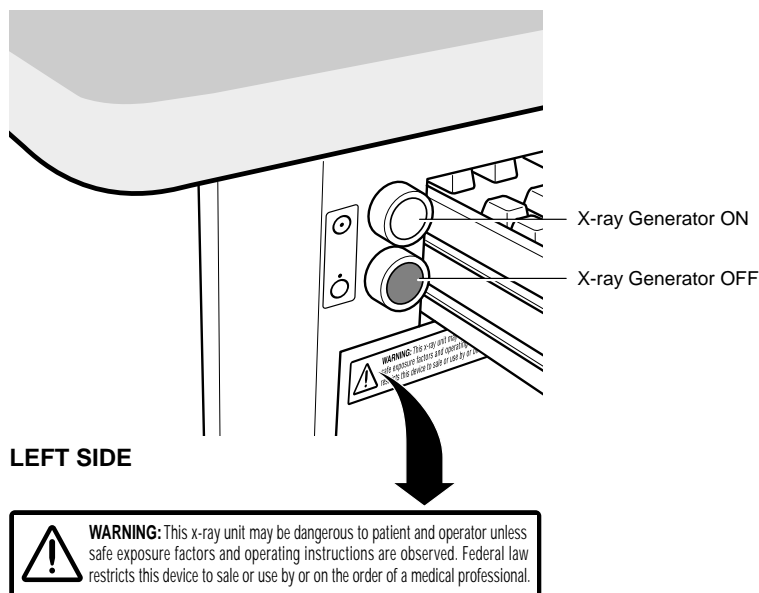
**Always power down the CPU as described above. Improper power down can cause loss of data.**

## Step 2: Powering Down the X-ray Generator

Powering down the X-ray Generator also typically powers down the other X-ray system components, such as the X-ray tube, overhead tube crane, Collimator, Bucky, and table.

**To power down the X-ray Generator,** press the X-ray Generator OFF button located at the front left of the DirectRay Console cabinet. Refer to Figure 2-13.

**Figure 2-13.**  
X-ray Generator Power  
Switch

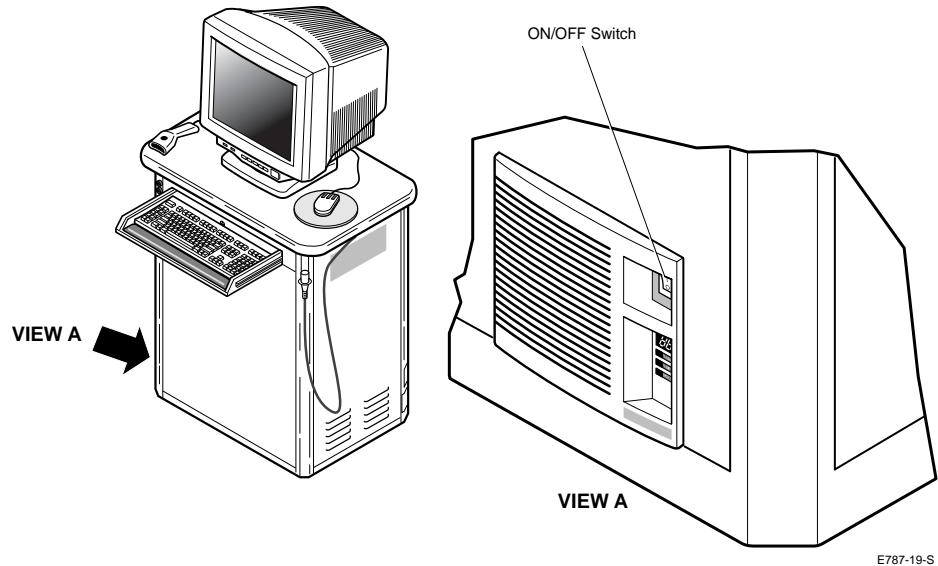


C781-274-U

## Step 3: Powering Down the DirectRay Console's UPS

**To power down the DirectRay Console's UPS,** press the UPS power switch to the Off (O) position. Refer to Figure 2-14. The DirectRay Detector and DirectRay Controller are powered off.

**Figure 2-14.**  
UPS Power Switch





# Chapter 3

## Managing the Image Output Queues and Resending Images

This chapter describes the procedures for managing the image output queues, and resending previously acquired images that are still stored in the system.

### Contents

<b>Subject</b>	<b>Page</b>
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Managing the Image Output Queues .....	3-3
Resending Images to Output Devices .....	3-6
Repreviewing Images .....	3-10

# Overview

**Note:** Images are not stored indefinitely. To ensure that there is always sufficient room to store newly acquired images, the system deletes the oldest images as needed to reclaim storage space.

However, you can protect specific patient images so that they will not be deleted. Refer to Chapter 5 for more information.

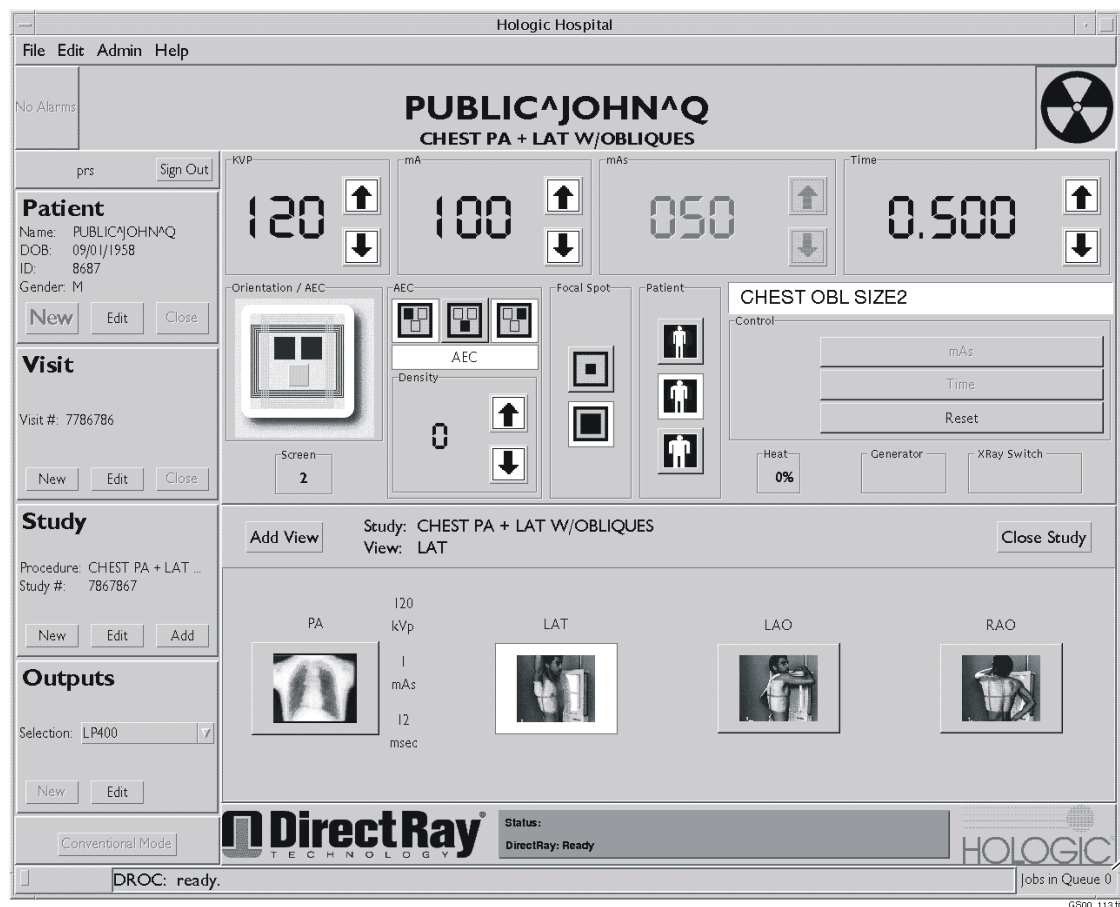
As images are captured, they are put in queues assigned to the output devices. The images wait in the queues until the DirectRay Console is able to establish communication with the output device, and the output device is ready to accept images. You can view the status of queued images, and remove images from a queue. For more information, refer to the topic “Managing the Image Output Queues” on page 3-3.

You can also resend images to the output destinations (for example, film printers or workstation displays) originally selected at the time of exposure, or to different output destinations. For more information, refer to the topic “Resending Images to Output Devices” on page 3-6.

# Managing the Image Output Queues

When you accept an acquired image, it is placed in an output queue controlled by the DirectRay Console application. A queue is used so that the image can be sent in the background, and you can go on acquiring other images.

On the main windows in the application, in the bottom right-hand corner, is an output queue status. This allows you to monitor whether the output is being processed. Refer to the following screen.



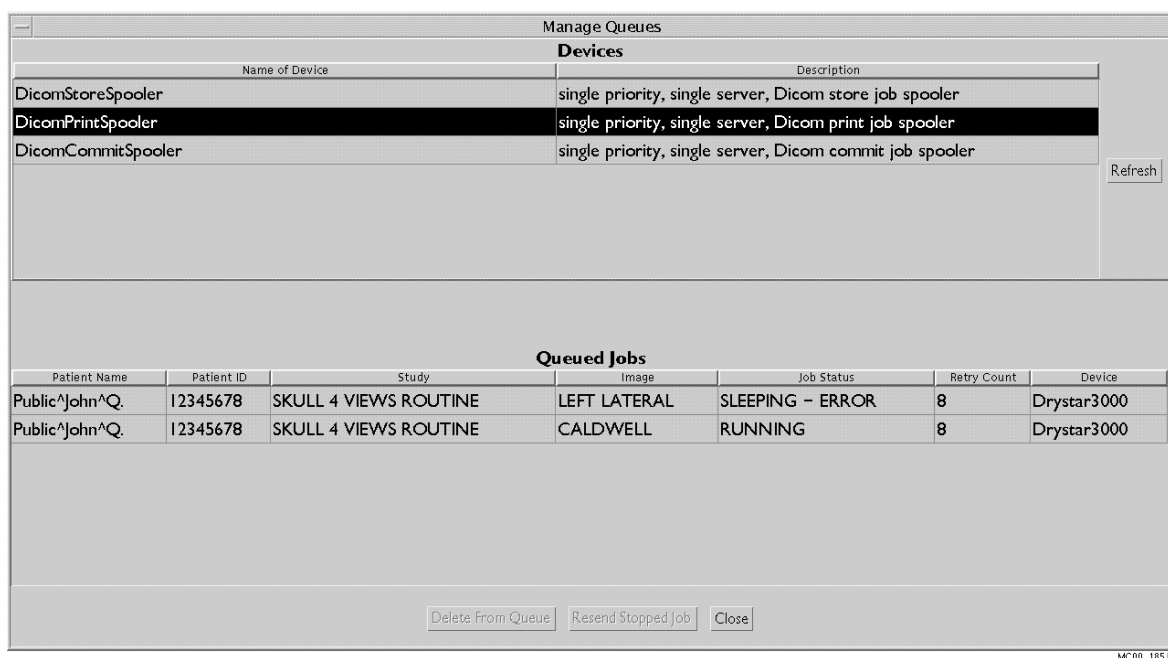
Because image files are large, they can sometimes stack up in the output queue. Also, if an output device is not responding or has a problem, the image cannot be sent and will be held in the queue. The DirectRay Console will retry sending the image, based on a retry count configured for the system.

You can examine the status of images in the output queue, and remove images from the queue.

To examine the status of images in the output queue, from the **Admin** menu choose **Manage Queues**. The Queue Management window displays.



The spoolers (queues) for the available output devices are listed in the **Devices** panel. The queued images are listed in the **Queued Jobs** panel. For queued images, the job status of **Sending**, **Waiting**, or **Problem** displays.



To display the jobs in a queue, choose the output device in the **Devices** list by clicking on it.

***Note:** If an output queue job is running, it cannot be deleted.*

To remove an image from the queue, choose the image by clicking on it in the **Queued Jobs** list, then click the **Delete from Queue** button.

To refresh the queue listing, click the **Refresh** button.

To exit, click the **Close** button.



**To resend the images from a stopped job,** choose the image by clicking on it in the Queued Jobs list, then click the **Resend Stopped Job** button.

Manage Queues

Devices

Name of Device	Description
DicomStoreSpooler	single priority, single server, Dicom store job spooler
DicomPrintSpooler	single priority, single server, Dicom print job spooler
DicomCommitSpooler	single priority, single server, Dicom commit job spooler

Refresh

Queued Jobs

Patient Name	Patient ID	Study	Image	Job Status	Retry Count	Device
ADAMS^JOHN^M	123456	SKULL 4 VIEWS ROUTINE	TOWNE	RUNNING	9	Drystar3000
Public^John^Q.	12345678	SKULL 4 VIEWS ROUTINE	CALDWELL	STOPPED - ERROR	20	Drystar3000
Public^John^Q.	12345678	SKULL 4 VIEWS ROUTINE	LEFT LATERAL	STOPPED - ERROR	20	Drystar3000
Public^John^Q.	12345678	SKULL 4 VIEWS ROUTINE	RIGHT LATERAL	SLEEPING - ERROR	19	Drystar3000
Public^John^Q.	12345678	SKULL 4 VIEWS ROUTINE	RIGHT LATERAL	SLEEPING - ERROR	19	Drystar3000
Public^John^Q.	12345678	SKULL 4 VIEWS ROUTINE	TOWNE	SLEEPING - ERROR	19	Drystar3000
Public^John^Q.	12345678	SKULL 4 VIEWS ROUTINE	CALDWELL	SLEEPING - ERROR	19	Drystar3000

Delete From Queue

Resend Stopped Job

Close


MC00\_210.H

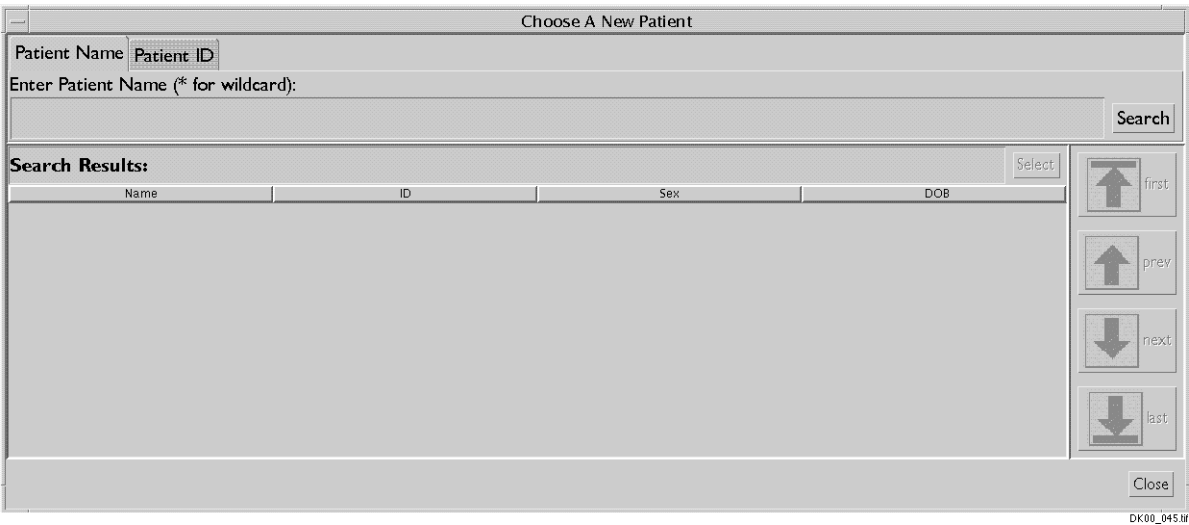
# Resending Images to Output Devices

The Resend function enables you to view thumbnails (small versions) of images previously acquired for a patient and then retransmit the full images to one or more specified output devices. In addition to the images, the original patient information, comments, and text annotations are sent.

***Note:** Images are not stored indefinitely. To ensure that there is always sufficient room to store newly acquired images, the system deletes the oldest images as needed to reclaim storage space. However, you can protect specific patient images so that they will not be deleted. Refer to Chapter 5 for more information.*

**To resend images from a previous patient exam:**

Step	Action
1	<div>From the <b>Admin</b> menu, choose <b>Image Management</b>.</div> <div> MC00_411.tif</div> <div>The Choose a New Patient window displays.</div>



Step	Action
2	<p><b>To search by patient name</b>, click the <b>Patient Name</b> tab, enter the name in the search field, then click the <b>Search</b> button or press the Enter key.</p> <p><b>To search by patient ID</b>, click the <b>Patient ID</b> tab, enter the ID in the search field, then click the <b>Search</b> button or press the Enter key.</p> <p>The list of patients matching the search criteria that you entered displays (for example, see the following sample window). For patients who have multiple studies, an entry is listed for each patient/study combination.</p> <p><b>Note:</b> You can use the asterisk (*) character as a wildcard character to broaden your search. For example entering <b>R*ph</b> would return patients named <b>Randolph</b> and <b>Rudolph</b>. If using the wildcard character, make sure you include at least one other character (that is, don't enter only an asterisk) to avoid creating a large listing of patients (up to the configured limit, the default is 50) which might take several minutes to complete.</p> <p><b>Note:</b> When searching for names, they are stored in the system as <b>LAST^FIRST^MIDDLE</b>. Therefore, searching for the first name <b>John</b> requires preceding it with an asterisk (that is, <b>*John</b>). Also, search entries are case insensitive; you can enter upper or lower case letters.</p>

Choose A New Patient

Patient Name Patient ID

Enter Patient Name (\* for wildcard):

pu\*

Search

Search Results: 2 entries

Name	ID	Sex	DOB
PUBLIC^JOHN^A.	57665	M	19780909
PUBLIC^JOHN^Q	8687	M	19580901

Select

first

prev

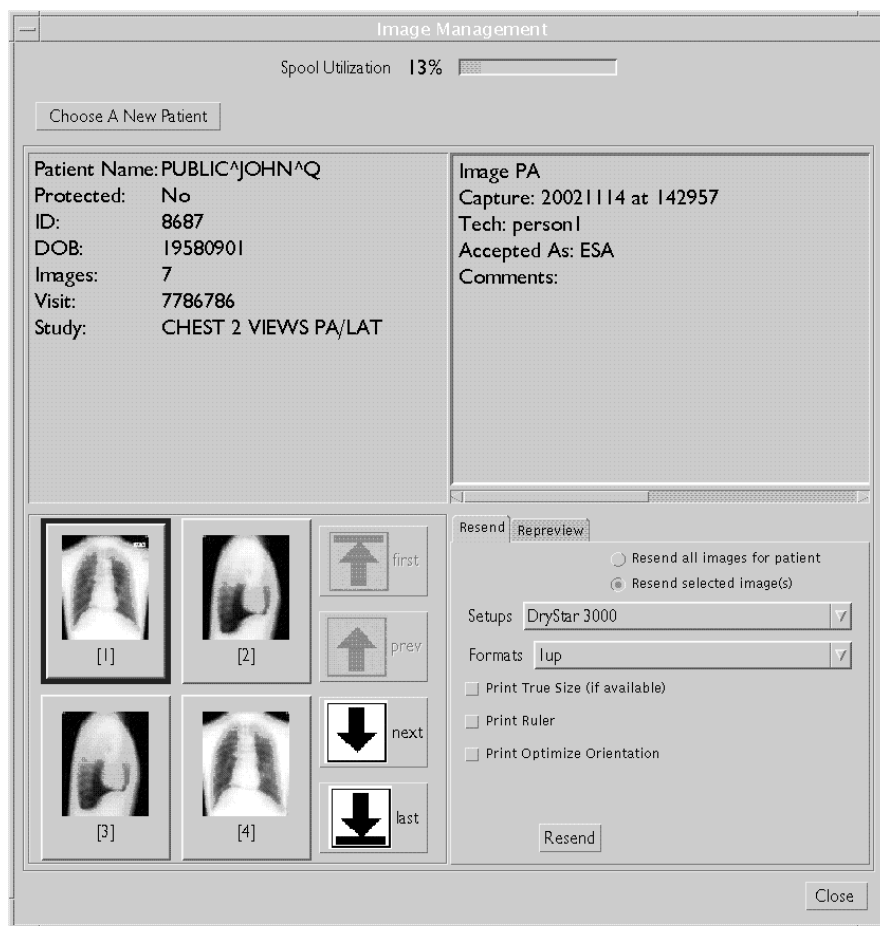
next

last

Close

GS00\_115.tif

Step	Action
3	<p>To choose a patient from the list, click on the patient entry.</p> <p>The Image Management window is updated, including the thumbnails (minimized views) of the images, and related patient and image information, as shown below.</p>



GS00\_346.tif

Step	Action
4	<p>Choose the Resend options you want to use.</p> <p>For a description of the options, refer to the table that follows this procedure.</p>
5	<p>To transmit the images, click the <b>Resend</b> button.</p> <p>A prompt displays a message that the resend was successful. Click the <b>OK</b> button.</p>

Step	Action
6	When you are done resending images, click the <b>Close</b> button to close the window.

Option	Description
Resend all images for patient	Use this option when you wish to send all images from a patient study.
Resend selected images for patient	Use this option when you wish to send a single or several images from a patient study.  Select all the required images by clicking on them. The border(s) turns blue. To deselect, click the image again.
Setups	Use this option to specify the devices to which you want to send the images.
Formats	Use this option if you are printing multiple images to one sheet.  <i><b>Note:</b> You must be sending the images to a printer to use this option.</i>
Print True Size	Use this option when you are printing to a printer that supports True Size and want to print the image at its true size.
Print Ruler	Use this option when you want to print a ruler on the sheet.
Print Optimize Orientation	Use this option when you want the destination hardcopy output device to adjust the image size and orientation to fit within its image area on the sheet at the largest size possible.

**To resend another patient's images**, click the **Choose a New Patient** button in the Resend window to redisplay the Choose a Patient window. Then repeat steps 2 to 8 from the previous procedure.

# Repreviewing Images

The Repreview function is used to manipulate an original image that has already been sent. You can take the original image, perform image enhancement functions such as cropping, image rotation, mirroring, or adding markers, and resend the image to the printer.

**To repreview an image:**

Admin

Manage Queues

Protect Patients

Calibrate

Image Management

DR Device Control

MC00\_411.tif

Step	Action
1	From the <b>Admin</b> menu, choose <b>Image Management</b> . The Choose a New Patient window displays.

Choose A New Patient

Patient Name Patient ID

Enter Patient Name (\* for wildcard):

Search

Search Results:

Select

Name	ID	Sex	DOB
------	----	-----	-----

first

prev

next

last

Close

DK00\_045.tif

Step	Action
2	<p>Locate the patient record:</p> <ul style="list-style-type: none"> <li>• <b>To search by patient name</b>, click the <b>Patient Name</b> tab, enter the name in the search field, then click <b>Search</b> or press the Enter key.</li> <li>• <b>To search by patient ID</b>, click the <b>Patient ID</b> tab, enter the ID in the search field, then click <b>Search</b> or press the Enter key.</li> </ul> <p>The list of patient records matching the search criteria that you entered displays (for example, see the following sample window).</p> <p><b>Note:</b> You can use the asterisk (*) character as a wildcard character to broaden your search. For example entering <b>R*ph</b> would return patients named <b>Randolph</b> and <b>Rudolph</b>. If using the wildcard character, make sure you include at least one other character (that is, don't enter only an asterisk) to avoid creating a large listing of patients (up to the configured limit, the default is 50) which might take several minutes to complete.</p> <p><b>Note:</b> When searching for names, they are stored in the system as <b>LAST^FIRST^MIDDLE</b>. Therefore, searching for the first name <b>John</b> requires preceding it with an asterisk (that is, <b>*John</b>). Also, search entries are case insensitive; you can enter upper or lower case letters.</p>

Choose A New Patient

Patient Name Patient ID

Enter Patient Name (\* for wildcard):

pu\*

Search

Search Results: 2 entries

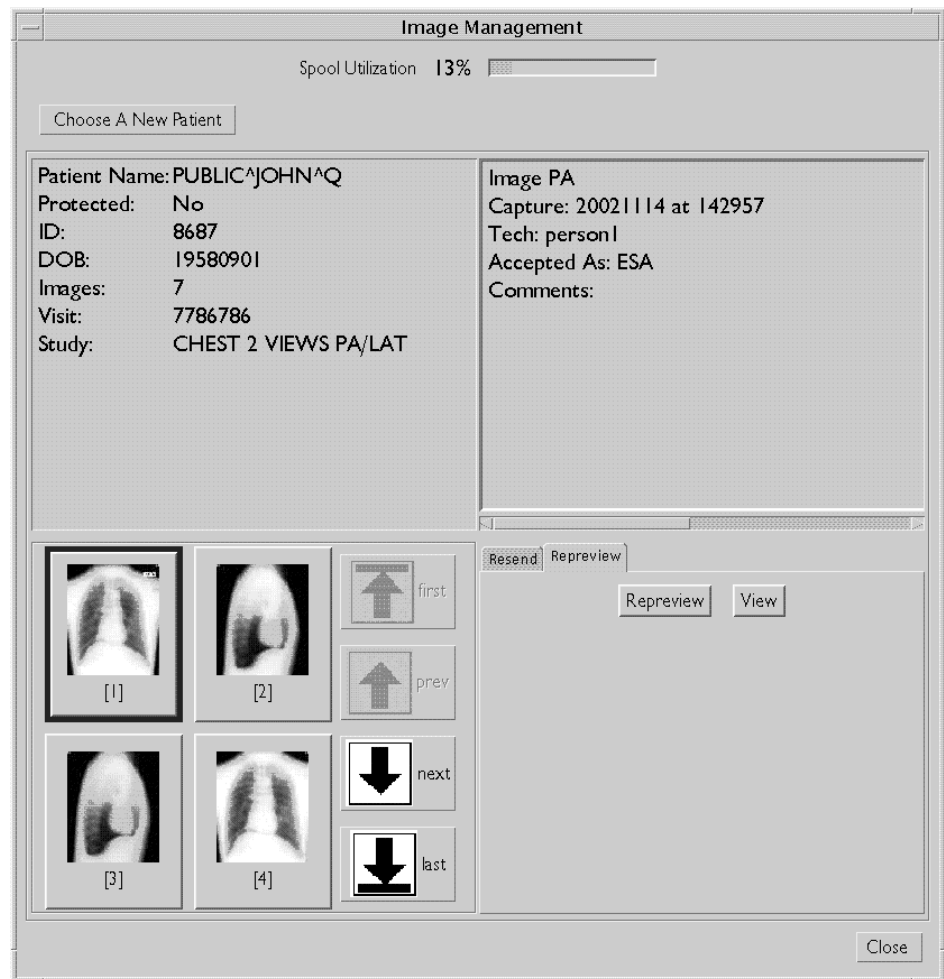
Name	ID	Sex	DOB
PUBLIC^JOHN^A.	57665	M	19780909
PUBLIC^JOHN^Q	8687	M	19580901

first prev next last

Close

GS00\_115.tif

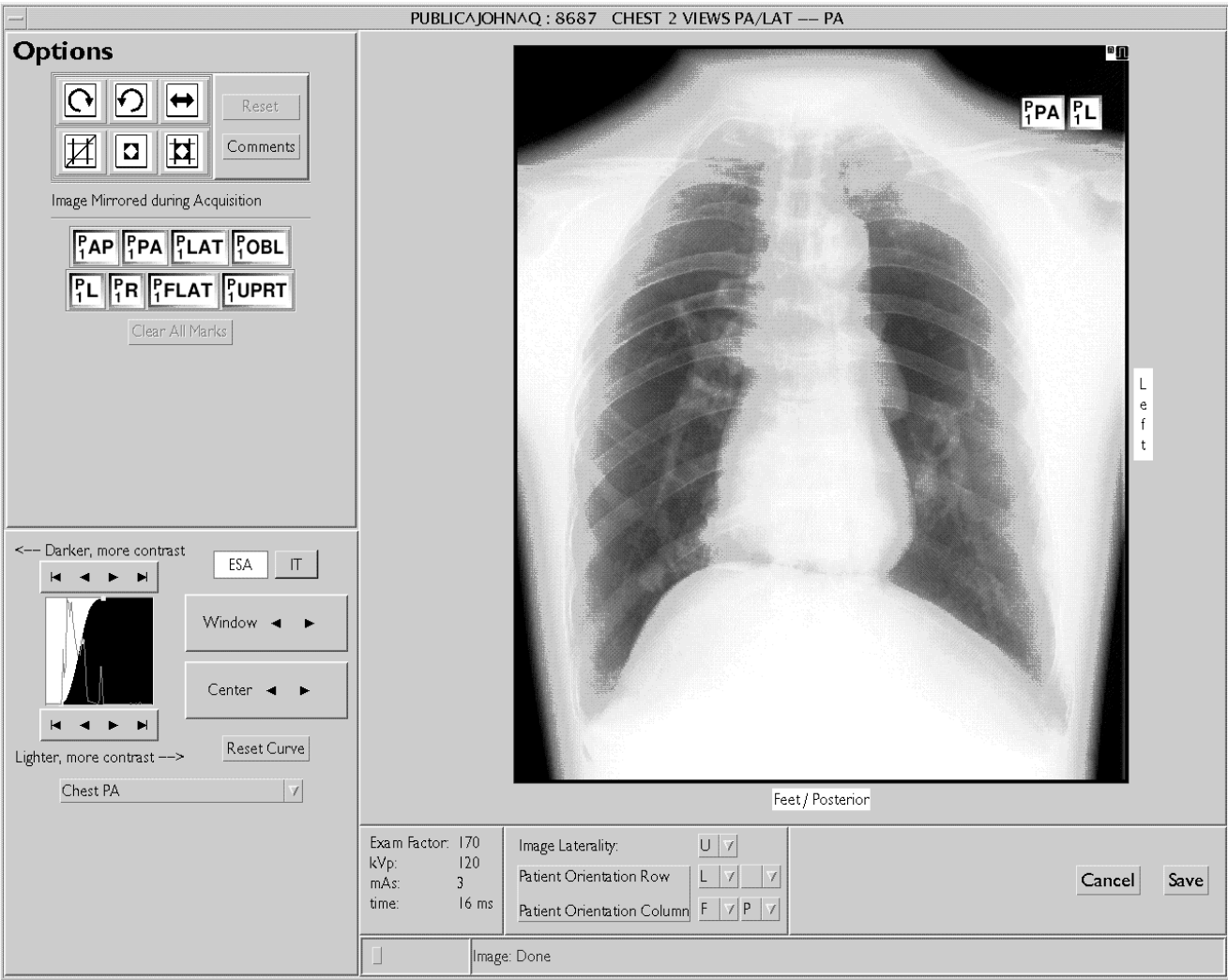
Step	Action
3	Choose the patient record from the list by clicking on it. The images for that patient display as thumbnails in the Image Management window.
4	If not already selected, click the Repreview tab.
5	Click on the image you want to repreview. The details pertaining to the image display in the upper-right box.



GS00\_348.tif



Step	Action
6	<p>Click the <b>Repreview</b> button.</p> <p>The Repreview window displays. The image is displayed with the options (rotate, mirror, cropping, masking, markers) and image processing settings as they were set when the image was accepted.</p>



GS00\_349.tif

Step	Action
7	<p>Make any changes that you want to the image.</p> <p>The changes that you make are applied to the original raw image data, just as they were when the image was first acquired.</p> <p>The functions in this window are the same as in the Image Preview window. For more information on them, refer to the topic “Working with Acquired Images” in Chapter 3.</p>
8	<p>To save your changes, click the <b>Save</b> button.</p> <p>The image is saved as a new image and the Spool Management window displays.</p>
9	Click the <b>Resend</b> tab.
10	<p>Choose the Resend options you want to use.</p> <p>For a description of the options, refer to the table that follows this procedure.</p>
11	Click the <b>Resend</b> button.
12	To close the resend function, click the <b>Close</b> button.

Option	Description
Resend all images for patient	Use this option when you wish to send all images from a patient study.
Resend selected images for patient	<p>Use this option when you wish to send a single or several images from a patient study.</p> <p>Select all the required images by clicking on them. The border(s) turns blue. To deselect, click the image again.</p>
Setups	Use this option to specify the devices to which you want to send the images.
Formats	<p>Use this option if you are printing multiple images to one sheet.</p> <p><i><b>Note:</b> You must be sending the images to a printer to use this option.</i></p>
Print True Size	Use this option when you are printing to a printer that supports True Size and want to print the image at its true size.

Option	Description
Print Ruler	Use this option when you want to print a ruler on the sheet.
Print Optimize Orientation	Use this option when you want the destination hardcopy output device to adjust the image size and orientation to fit within its image area on the sheet at the largest size possible.



# Chapter 4

## Protecting Patient Records

This chapter explains how to protect patients and their related images from being deleted by the system.

### Contents

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Reclamation Strategy .....	4-2
Procedure for Protecting a Patient Record.....	4-3

# Overview

Patient records and images are stored in the DirectRay Console CPU temporarily, until storage space begins to get low. Then, the system deletes the oldest patient records and images to make room for new ones.

The amount of storage space depends on the specific storage capacity configured for your DirectRay Console. Your Del service representative can tell you approximately how many images can be stored before reclamation begins.

You can protect patient records, and the related images, from being deleted as part of this reclamation process. You might want to do this if you will be creating new studies for the patient and want to avoid having to enter the demographic information again. Or, you may want to resend images to output devices.

## Reclamation Strategy

When the available storage capacity drops below a predefined level, patient records and images are deleted on a first-in-first-out basis.

When a patient record is due for deletion, the image spool is checked for images associated with the patient record to be reclaimed; then the following rules are applied:

- If any of the patient's images are in the image queue, the patient record is not reclaimed.
- If any of the patient's images are in the reject bin, the patient record is not reclaimed.
- If there are no images in the image queue or reject bin associated with the patient, and a patient's study is not currently open, the patient record and related images are eligible for deletion.


**Note:** Image reclamation is independent of the patient record reclamation. Deleting images as part of reclamation does not cause the related patient record to be deleted. Patient records tend to stay in storage longer than images.

Images are deleted on a study basis. That is, once acquired images in a study have been sent to their output devices and the study is closed, the images in that study are eligible for deletion (unless the patient record is protected). This is true even if the study is incomplete (that is, images have not been acquired for all views in the related procedure).

# Procedure for Protecting a Patient Record

**Note:** It is strongly recommended that you do not protect too many patient records unnecessarily. The system is not intended to be an archiving system. If too many images are protected from removal, you might run out of space to store new images.

To protect a patient record and the related images:

Step	Action
1	<p>From the <b>Admin</b> menu, choose <b>Protect Patients</b>.</p>  <p>The Protect Patients window displays.</p>
2	<p>Find the patient whose record you want to protect:</p> <ul style="list-style-type: none"> <li>• <b>To search by patient name</b>, click the <b>Patient Name</b> tab, enter the name in the search field, then click the <b>Search</b> button or press the Enter key.</li> <li>• <b>To search by patient ID</b>, click the <b>Patient ID</b> tab, enter the ID in the search field, then click the <b>Search</b> button or press the Enter key.</li> </ul> <p><b>Note:</b> You can use the asterisk (*) character as a wildcard character to broaden your search. For example entering <b>R*ph</b> would return patients named <b>Randolph</b> and <b>Rudolph</b>. If using the wildcard character, make sure you include at least one other character (that is, don't enter only an asterisk) to avoid creating a large listing of patients (up to the configured limit, the default is 50) which might take several minutes to complete.</p> <p><b>Note:</b> When searching for names, they are stored in the system as <b>LAST^FIRST^MIDDLE</b>. Therefore, searching for the first name <b>John</b> requires preceding it with an asterisk (that is, <b>*John</b>). Also, search entries are case insensitive; you can enter upper or lower case letters.</p> <p>The list of patients matching the search criteria that you entered displays (for example, refer to the following sample window).</p>

Protect Patients

Patient Name Patient ID

Enter Patient Name (\* for wildcard):

pu\* Search

Search Results: 2 entries Select

Name	ID	Sex	DOB	Protected
PUBLIC^JOHN^A.	57665	M	19780909	no
PUBLIC^JOHN^Q	8687	M	19580901	yes

first

prev

next

last

Protect Close

GS00\_118.tif

Step	Action
3	Choose an unprotected patient record from the list (protected status is “no”) by clicking on the patient name, then click the <b>Protect</b> button.  The patient record’s protect status changes to “yes” (protected).
4	To close the window, click the <b>OK</b> button.

***Note:** The button label toggles between **Protect** and **Unprotect**.*

**To unprotect a patient record,** follow the same procedure as above, except choose the protected patient record entry. Then click the **UNProtect** button. The patient record’s protect status changes to “no” (unprotected).



# Chapter 5

## Maintaining System Components

This chapter explains how to:

- Perform maintenance for the X-ray equipment
- Calibrate the DirectRay Detector

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Monthly Maintenance .....	5-3
System Periodic Maintenance .....	5-4
Replacing the UPS Battery .....	5-5
Reporting Unusual Conditions .....	5-5
Calibrating the DirectRay Detector .....	5-6

# Overview

System components require little special care. Normal care in handling and operating the equipment should ensure continuing satisfactory performance.

Some considerations for daily, weekly, and monthly maintenance of the equipment are provided here to prevent possible equipment damage or failure.

Also, this chapter describes how to calibrate the DirectRay Detector.

## Daily Maintenance

The DirectRay Console should be powered down once a day to ensure a complete system reset. For detailed instructions, refer to “Step 1: Powering Down the DirectRay Console CPU” in Chapter 2.

It is also recommended that you power down the DirectRay Console if you are not going to use it for an extended period (for example, overnight).

## Weekly Maintenance

The DirectRay Detector should be calibrated once a week. For detailed instructions, refer to the topic “Calibrating the DirectRay Detector” on page 5-6.

# Monthly Maintenance

Perform the following general preventive maintenance procedures on a monthly basis. The equipment must be maintained in good operating order at all times to provide safe conditions for operating personnel and patients.



**CAUTION**

**Do not attempt mechanical or electrical repair of the equipment. Contact your Del service representative if any unit does not perform to your satisfaction.**

## Cleaning the Equipment

***Note:** Follow your hospital's cleaning and decontamination policies and procedures.*

The exterior of the equipment can be cleaned with common hospital decontamination solutions that are acceptable for use with plastics or enameled metal. To apply the cleaning solution, power down the system and disconnect the power source. Then moisten a cloth with the solution and wipe down the equipment.



**CAUTION**

**Do not use isopropyl alcohol on the Bucky as it may damage (remove) the silk screening.**



**CAUTION**

**Do not spray cleaning solution directly onto any part of the equipment. Instead, moisten a cloth with the solution and wipe it clean.**



**CAUTION**

**Do not immerse the equipment in liquid.**



**CAUTION**

**Do not autoclave the equipment.**

## Checking the Equipment Integrity

You should perform the following checks to ensure that the equipment is functioning and operating safely:

- Ensure fastening hardware is tight, and that there are no missing or defective parts.
- Ensure buttons and switches which are supposed to light, do.
- Check that indicators and lights are working properly.
- Ensure all switches operate smoothly.
- Check all exterior painted or plated surfaces for evidence of deterioration. Ensure all name plates, legal labels, and warning labels are legible and secure.
- Ensure electrical cables, cords, connectors, and fittings are secure. Check all cables for abrasions and damage; pay particular attention to locations where cables are draped and subject to stress due to tube positioning.

## System Periodic Maintenance

The recommended schedule of required tests should be performed at the required intervals by either the X-ray equipment dealer or an authorized service technician. To ensure continuing compliance with the U.S. Department of Health and Human Services Regulations, these tests may be performed more frequently than the indicated intervals. The service technician must conduct the tests pursuant to the requirements of 21 CFR 1020.30.

Refer to recommended maintenance schedules for the certified components.

The recommended maintenance schedule for the Radiographic Table, Omniflex IV Overhead Tube Crane, DirectRay Detector, and X-ray tube is:

- First servicing: 90 days after installation
- Subsequent servicing: every six months

## Replacing the UPS Battery

The battery inside the uninterruptible power supply (UPS) must be replaced periodically. The information provided in the UPS manual about battery replacement is for reference only. Contact your Del service representative for UPS service and battery replacement.



**The UPS battery must be replaced by an authorized Del representative. The UPS battery contains lead and poses a hazard to the environment and human health if not disposed of properly.**

## Reporting Unusual Conditions

Report any unusual equipment condition that occurs between periodic servicing to your Del service representative.

Report any unusual noise, difficulty of motion, squeaks, malfunctions, or other problems with the equipment at your earliest convenience.

If a failure occurs, it could speed repair if you can supply specific information to the service representative. Make a note of any unusual events prior to the failure. Also note the type of procedure in progress, as well as specific failure information.

# Calibrating the DirectRay Detector

You must calibrate the DirectRay Detector once a week.

## To calibrate the DirectRay Detector:

***Note:** Calibration must be performed at least one hour **after** system startup or power up from the sleep mode.*

Step	Action
1	Ensure everyone is out of the X-ray room.
2	In the DirectRay Console application's main window, close any open study and ensure that no patient is selected.
3	<p>From the <b>Admin</b> menu, choose <b>Calibrate</b>.</p> <p>The Calibration Test panel displays. This panel includes instructions for how to set the technique settings and take exposures for the calibration. The sample on the next page shows an example of the instructions.</p> <p><i><b>Note:</b> The instructions for your site may be different from what is shown in the sample window.</i></p> <p><i><b>Note:</b> The <b>Create New Pixel Map</b> button function is available only to <b>mgr</b>-level users. For more information, refer to the DirectRay Console Administrator Guide.</i></p>

Hologic Hospital

File Edit Admin Help

No Alarms

## CALIBRATION MODE

Not for Patient Exposure

person3 Sign Out

**Patient**

Name:  
DOB:  
ID:  
Gender:

New Edit Close

**Visit**

Visit #:

New Edit Close

**Study**

Procedure:  
Study #:

New Edit Add

**Outputs**

Selection: no outputs

New Edit

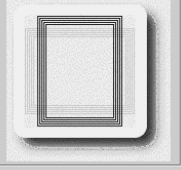
Conventional Mode


KVP  
80


mA  
200


mAs  
005

Time  
0.025

Orientation / AEC  


AEC  


Focal Spot  


Patient  


**CALIBRATE PA SIZE2**

Control

mAs

Time

Reset

Heat 0% Generator XRay Switch

**Calibration**

Note: The calibration below should be performed each week.

Cautions: Do not calibrate the unit unless it has been ON for at least 3 hours.


Do not calibrate the array if Temp1 or Temp2 exceed 33 °C.\*

1.) For all general radiographic units:

- gently remove the grid from the Bucky
- place the X-ray tube and Bucky in the Chest scanning position [183 cm (72") SID or greater] and PORTRAIT orientation


2.) Manually, open the collimator to ensure full coverage of the Bucky and ensure that there are no lead markers or other items in the beam path.

Restart Calibration Sequence   Accumulate Calibration   Create New Pixel Map   End Calibration Sequence



Status:

DirectRay: Ready

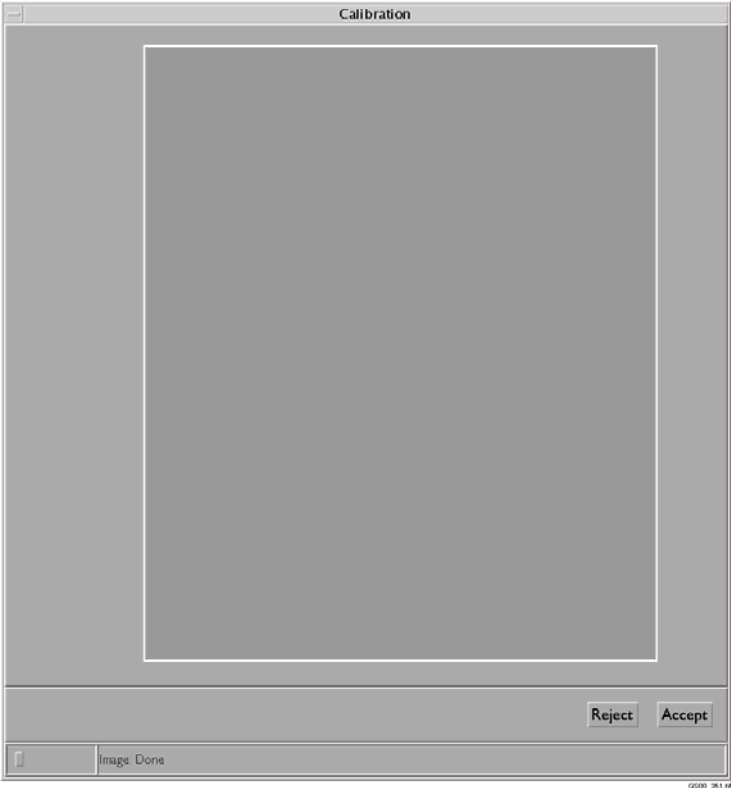


DROC: ready.

Jobs in Queue 0

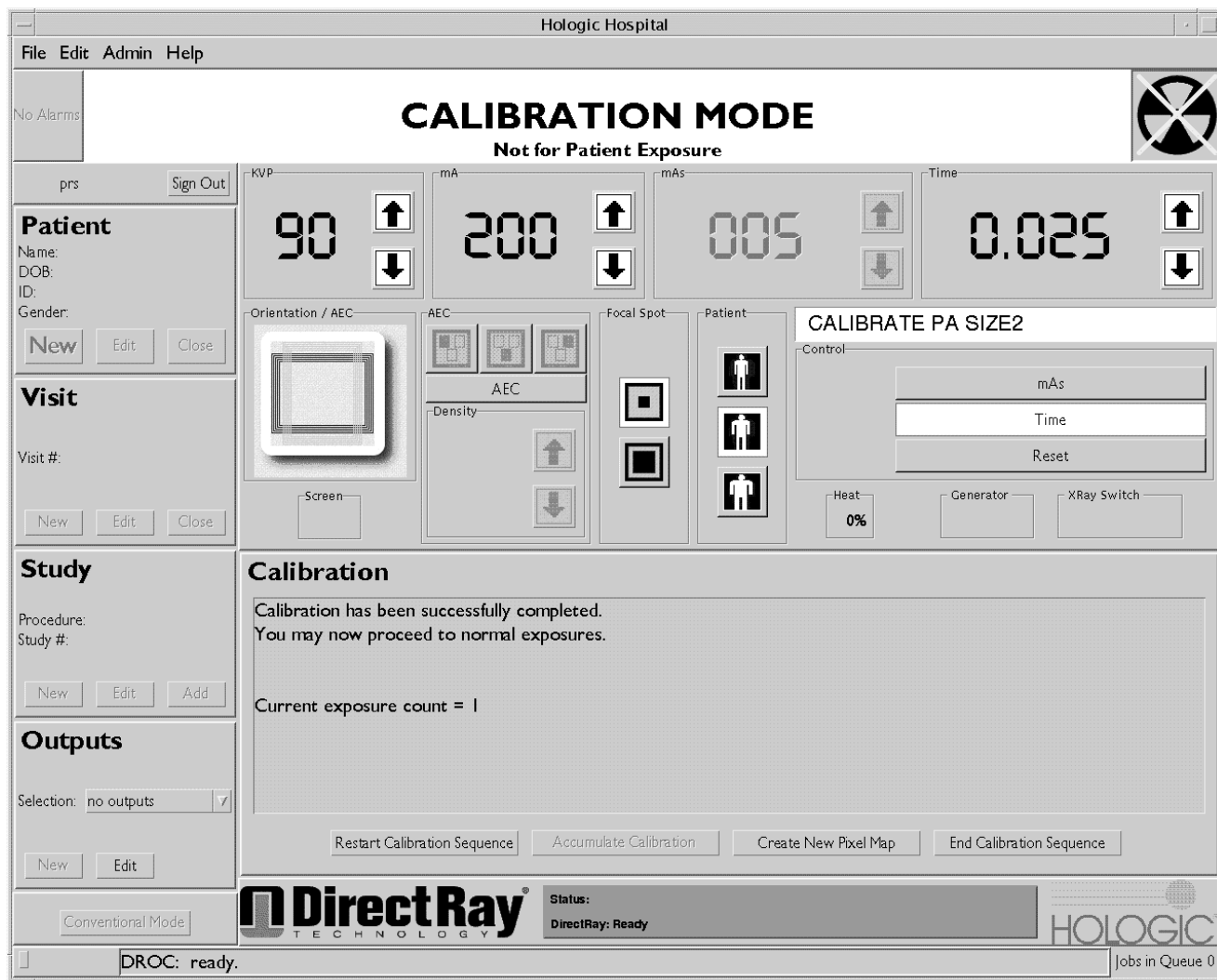
GS00\_360.tif

Step	Action
4	Change the technique settings, as defined in your Calibration Test panel.
5	Remove the grid.

Step	Action
6	<p>Take an exposure.</p> <p>The Calibration window with the flat field image displays.</p> 
7	<p>Click the <b>Accept</b> or <b>Reject</b> button.</p> <p><i>If you accept the image</i>, calibration runs. The progress of the calibration displays in the calibration panel in the message bar at the bottom of the window.</p> <p><i>If you reject the image</i>, you are prompted to enter a Rejection comment. Enter the comment and click the <b>Reject</b> button. The Calibration Test panel displays. Correct the problem and return to step 6.</p> <p><i>Note:</i> You would reject an image if it exhibits any edge cut-off due to collimation or misalignment or if there are any artifacts from debris or obstructions.</p>



Step	Action
8	<p>Wait until the status bar turns green and the message in the panel says “Calibration.”</p> <p><i>If the calibration is successful</i>, a <b>1</b> displays in the calibration panel. Go to step 9.</p> <p><i>If the calibration is not successful</i>, adjust the technique settings and take another exposure.</p>



GS00\_371.HF

Step	Action
9	Click the <b>Accumulate Calibration</b> button.
10	Repeat steps 6 through 9 until you have accumulated <b>four</b> calibrations.
11	When you are finished with the calibration sequence, click the <b>End Calibration Sequence</b> button.

**If you want to discard the accumulated calibrations and start over,** click the **Restart Calibration Sequence** button.

# Chapter 6

## Troubleshooting

This chapter explains how to perform basic troubleshooting operations. It identifies and explains how to handle common system problems that do not require service intervention, and provides a listing of system alarms and error codes.

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Troubleshooting Image Problems .....	6-6
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# Overview

This chapter lists the error codes, error conditions, and alarms that the system components can produce. This includes:

- DirectRay Console component problems, related to starting up the DirectRay Console or problems with system peripherals such as the keyboard or bar code scanner, and so on.
- How to determine the status and reset the X-ray Generator
- DirectRay Console alarms function, related to the DirectRay Console application, the DirectRay Detector, and remote devices on the network such as printers and view workstations.
- Loss of power, causing the Uninterruptible Power Supply (UPS) to provide backup power.
- X-ray Generator error codes.

Refer to the following topics for a complete listing and recommended actions.

The error messages whose source is a problem with either the DirectRay Console application, the DirectRay Controller, or the DirectRay Detector typically include an explanation of the problem and suggested corrective action. These error messages are not included in this chapter.

Also, for a listing of the error messages related to the X-ray tube, tube suspension arm, or Collimator, refer to the accompanying user guide for those components.

# CPU Problems

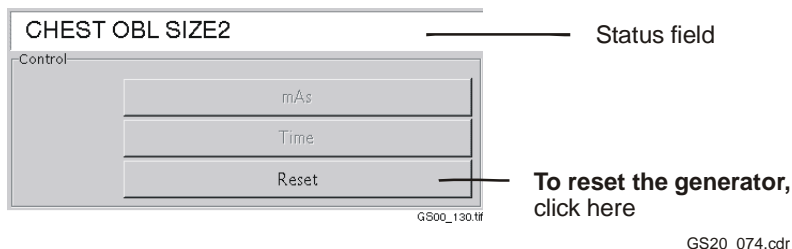
This topic explains simple corrective steps you can take to troubleshoot common CPU problems that might occur in the course of daily operations. Table 6-1 lists each problem and the appropriate corrective actions.

**Table 6-1. CPU Problems**

<b>If this happens:</b>	<b>Do this:</b>
The CPU does not startup after pressing the power key on the keyboard.	Contact Del service.
During startup, one of the tasks in the Startup window fails.	Power down the CPU (refer to “Step 1: Powering Down the DirectRay Console CPU” in Chapter 2), and power up the unit again.  If it still fails, contact Del service.
The CPU powers up successfully, but reports a blocking error.	Power down the CPU (refer to “Step 1: Powering Down the DirectRay Console CPU” in Chapter 2), and power up the CPU again.  If the blocking error occurs again, contact Del service.
The CPU powers up successfully, but the DirectRay Console application does not start.	Contact Del service.
The keyboard is not responding.	Contact Del service.
Mouse/trackball is not responding.	Contact Del service.
You cannot logon.	Ensure you are using the correct login and password. Note that passwords are case sensitive.  If you are still having a problem logging on, contact Del service.
The CPU user interface is locked.	Contact Del service.
The system cannot read a scanned bar code.	Contact Del service.

## X-ray Generator Problems

The Techniques portion of the DirectRay Console application's main window includes an X-ray Generator Status field, shown below. After an exposure or other Generator event, the most current status displays here. If there is more than one message, click on the up or down arrow buttons that appear to scroll through the messages.



X-ray Generator error messages are also displayed here. For a list of Generator error codes, refer to the topic "X-ray Generator Error Codes (CPI)" on page 6-11. The error message is cleared automatically by the Generator when the error condition is corrected or when you click the **Reset** button. For more information about resetting the Generator, refer to the next topic.

## Resetting the X-ray Generator

**Note:** The need to repeatedly reset the system can indicate a serious problem. If this occurs, contact Del service.

You may need to reset the X-ray Generator after a fault is detected.

When the X-ray Generator detects a fault, the **Reset** button in the Control panel (shown above) is enabled and further exposures are prevented. Click the **Reset** button to clear the displayed error message and return the system to normal operation.

# Console Alarm Messages

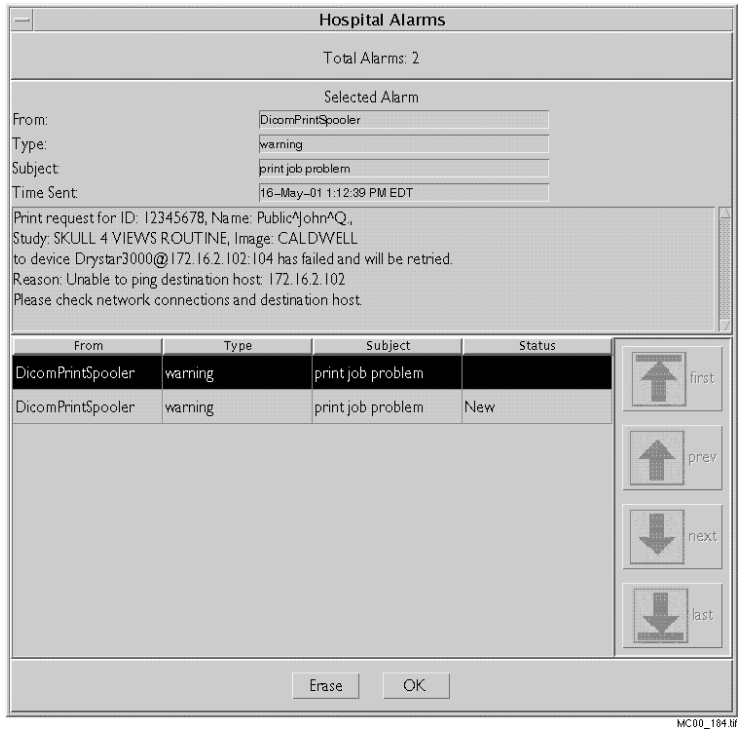
The **Alarms** button at the upper-left corner of the DirectRay Console user application's main window notifies you of DirectRay Console and DirectRay Detector alarms, as well as alarms from networked components such as printers or view workstations.

When one or more alarm conditions exist, the label of the **Alarms** button lights yellow and the number of pending alarms displays in it. Once you have opened and closed the Alarms window, the label turns back to black.

To view alarms, click the **Alarms** button on the main screen.



A list of current alarms displays. The Status column indicates whether an alarm has been viewed before; a status of “New” indicates that it has not.



**To view information about an alarm,** choose the alarm entry in the list; the source, time, and other information about the alarm displays.

**To scroll through the list of alarms,** use the navigation buttons next to the list.

**To erase an alarm,** choose it, then click the **Erase** button.

**To close the Alarms window,** click the **OK** button.

***Note:** Some alarms cannot be erased by a user, but are cleared by the device reporting the error once the error condition has been corrected.*

## Troubleshooting Image Problems

The following topics explain how to maximize the image quality, and diagnose and correct image problems.

### Guidelines for Ensuring Good Images

Following are some guidelines for ensuring that the images you capture are of the highest quality possible:

- Ensure the correct Patient Size setting is used, especially when the patient is very large. This will allow the system to use correct exposure parameters and avoid using back-up timing.
- Unlike a standard X-ray system, the DirectRay system applies a mathematical algorithm to present the image on the monitor. If the presentation does not appear to be yielding the desired results, the exam-specific algorithm (ESA) may need to be adjusted.
- If the densities on the film are not as they appear on the monitor, an adjustment or reconfiguration may be required by a Del representative.



## Diagnosing and Correcting Image Problems

Refer to Table 6-2 for information about how to correct image problems.

**Table 6-2.** Image Problems

<b>If this happens:</b>	<b>Do this:</b>
Image on film has a line drop-out.  A line drop-out looks like a clear scratch, usually going through the middle of the image.  The image is very dark or very light.	Contact Del service.    Check to see if the appropriate ESA was selected in the Preview Image window. If not, choose an appropriate ESA from the drop-down list.  You might also try manually adjusting the minimum and maximum densities (refer to Chapter 3 in the <i>DirectRay Console User's Guide</i> for more information).  However, if the dose is simply too low, there will not be enough digital information to create an acceptable image. X-ray the patient again, using a more appropriate mAs setting.
There is noise in the image.	In general, image noise will appear different than screen-film because the image data is digital. While noise can be affected by dose (as in standard X-rays), it can also be affected by the exam-specific processing.  Note any cases of excessive noise, and contact Del service about the problem.
Image on film has speckles or "snow".	Contact Del service.

## Miscellaneous Problems

Table 6-3 lists miscellaneous problems that can occur when using the system, and suggested responses.

**Table 6-3. Miscellaneous Problems**

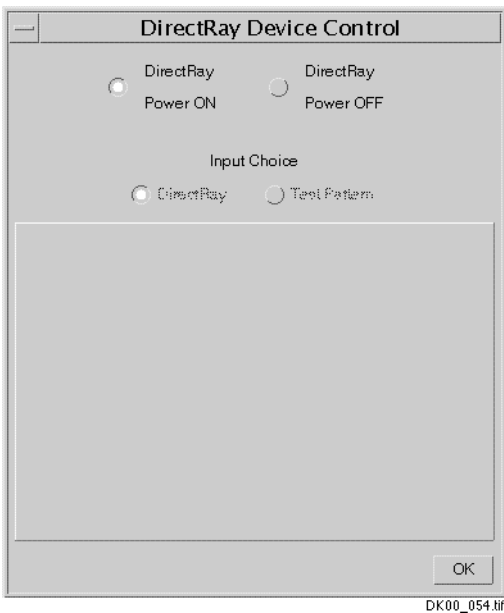
<b>If this happens:</b>	<b>Do this:</b>
UPS power switch does not turn the DirectRay Detector and DirectRay Controller on.	Contact Del service.
X-ray equipment power switch at the DirectRay Console does not turn the X-ray Generator on.	Ensure that power is being supplied to the Generator. If there is still a problem, contact Del service.
The technique settings in the DirectRay Console main window display dashes instead of setting numbers.	There is a problem in connection between the X-ray Generator and the DirectRay Console. Contact Del service.
The Bucky will not rotate to the other orientation position.	Contact Del service.
The Collimator does not operate.	Contact Del service.
If the image does not transfer to a selected output device and the DirectRay Console does not display a related alarm.	There is either a problem in the connection between the DirectRay Console and the output device, or there is a problem with the output device. Contact Del service and/or the manufacturer of the output device.

# Powering the DirectRay Components On and Off

Using the Device Control function, you can power the DirectRay components (that is, the DirectRay Controller and DirectRay Detector) on and off.

**Typically, you should not power the DirectRay components off; you would only do this at the direction of a Del service representative.**

**To power the DirectRay components off:**

Step	Action
1	Finish or close the open study.
2	From the <b>Admin</b> menu, choose <b>Device Control</b> . The DirectRay Device Control window displays.
	
3	Choose the <b>DirectRay Power Off</b> setting.
4	To turn off power to the DirectRay components and close the window, click the <b>OK</b> button.

**To power the DirectRay components back on,** redisplay the DirectRay Device Control window, choose the **DirectRay Power On** setting, then click the **OK** button.

## Loss of Electrical Power

In the event of a loss of electrical power to the DirectRay Console's Uninterruptible Power Supply (UPS), the UPS automatically provides about 10 to 15 minutes of backup power to the CPU, DirectRay Controller (in the cabinet), and DirectRay Detector. While backup power is being used, the UPS sounds a high-pitched alarm.

If the UPS backup power is activated, the DirectRay Console begins a 5-minute counter. If normal power is restored within five minutes, the DirectRay Console automatically switches back to normal power. If normal power is not restored within five minutes, the DirectRay Console commences an orderly shutdown. You cannot interrupt this shutdown.

Determine the cause of the power loss and resolve the problem before attempting to start up the system again.

For details about restarting the system, refer to the topic "Starting Up and Logging On to the System" in Chapter 2.

# X-ray Generator Error Codes (CPI)

**Note:** The need to repeatedly reset the system can indicate a serious problem. If this occurs, contact your Del service representative.

**Note:** An \* indicates that an error is not recoverable.

Table 6-4 lists the X-ray Generator (CPI model) error codes that can be displayed at the DirectRay Console main window.

When the X-ray Generator detects a fault, the **Reset** button in the control panel on the DirectRay Console main window is enabled and further exposures are prevented. Click the **Reset** button to clear the displayed error message and return the system to normal operation.

**Table 6-4.** CPI Error Code Descriptions

<b>Generator Error Code</b>	<b>Description</b>
E001	Generator CPU EPROM checksum error*
E002	Generator CPU EEPROM data checksum error*
E003	Generator CPU NVRAM error*
E004	Generator CPU Real Time Clock error
E005	Main Contactor error*
E006	Rotor Fault
E007	Filament Fault
E008	Beam Fault
E009	Power Supply Not Ready
E010	No kV during exposure
E011	mA during exposure too high
E012	mA during exposure too low
E013	Operator released exposure switch during exposure
E014	AEC exposure exceeded allowed back up time
E015	AEC exposure exceeded allowed back up mAs
E016	Tomo Back-up Timer—Exposure Terminated
E017	Uncalibrated Exposure Parameter
E018	Preparation Time-out Error
E019	Selected parameters will cause X-ray tube to exceed its programmed anode heat limit
E020	Thermal Switch Interlock #1 Error

**Table 6-4. CPI Error Code Descriptions**

<b>Generator Error Code</b>	<b>Description</b>
E021	Thermal Switch Interlock #2 Error
E022	Door to X-ray room is open
E023	Collimator error—not ready
E024	Cassette Interlock Error
E025	II Safety Interlock Error
E026	Spare Input Interloc Error
E027	Receptor Time-out Error—Receptor did not respond within time-out
E028	Prep Input active during Initialization Phase*
E029	X-ray Input active during Initialization Phase*
E030	Fluoro Input active during Initialization Phase*
E031	Communication Error Remote Fluoro
E032	Communication Error Console
E033	Lithium Battery Low Voltage Error
E034	+12 Vdc Error
E035	-12 Vdc Error
E036	+15 Vdc Error
E037	-15 Vdc Error
E038	Calibration Data Corrupt Error
E039	AEC Data Corrupt Error
E040	Fluoro Data Corrupt Error
E041	Receptor Data Corrupt Error
E042	Tube Data Corrupt Error
E043	High Voltage Error—kV detected in non X-ray state
E044	Invalid Communication Message
E045	Communication Message Not Supported
E046	Communication Message Not Allowed
E047	Fluoro Timer Limit Error

**Table 6-4. CPI Error Code Descriptions**

<b>Generator Error Code</b>	<b>Description</b>
E048	Focus Mismatch Error
E049	Not Enabled Error
E050	Generator Limit Data Corrupt Error
E051	Generator has detected no feedback signal from AEC device
E052	High Small Focus Filament Current Error in Standby
E053	High Large Focus Filament Current Error in Standby
E054	AEC Reference is out of range
E055	No Fields Selected in AEC mode
E056	No Tube Programmed
E057	AEC Stop signal in wrong state
E058	Console Back-Up Timer
E059	Housing Heat Limit Exceeded
E060	High kV Error
E061	Low kV Error
E062	EXP_SW signal active in standby state
E063	Factory Defaults Enabled
E064	No Exposure Release
E065	Tomo Device Error
E066	No Sync Pulse Input
E067	Power Supply Duty Cycle Limited
E100	Calibration Error—Maximum mA Exceeded
E101	Calibration Error—Calibration Data Table Exceeded
E102	Calibration Error—Maximum Filament Current Exceeded
E103	Calibration Error—Manually Terminated
E104	Calibration Error—No mA
E105	Calibration Error—Minimum mA not calibrated
E200	Anode Warning Level Exceeded

**Table 6-4. CPI Error Code Descriptions**

<b>Generator Error Code</b>	<b>Description</b>
E201	Fluoro Timer Warning Level Exceeded
E211	Calibration Limit, Selected parameter not Calibrated
E212	Generator AEC Density Limit
E213	Invalid Communication Parameter
E214	Housing Heat Warning
E215	CT Termination Input Wrong State
E216	Deselect Tomo Table
E217	Select Tomo Angle
E218	Invalid Tomo Angle
E219	Generator PPS Limit
E220	Generator Power Supply Duty Cycle Warning



# Appendix A

## Specifications

This appendix provides:

- System specifications
- Environmental and installation requirements

### Contents

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Installation Requirements .....	A-6

## Subsystem Specifications

This topic contains specifications for the following subsystems:

- DirectRay Image Capture system (DirectRay Detector and DirectRay Controller)
- DirectRay Console
- Ceiling mounted tube suspension
- X-ray Generator
- Radiographic Table

### DirectRay Image Capture System

Weight	DirectRay Detector 8.6 kg (19 lb) DirectRay Controller 7.3 kg (16.3 lb)
Dimensions	DirectRay Detector Width: 46.7 cm (18.4 in.) Height: 46.7 cm (18.4 in.) Depth: 4.3 cm (1.7 in.)  DirectRay Controller Width: 49.5 cm (19.5 in.) Height: 37.8 cm (14.9 in.) Depth: 9.4 cm (3.7 in.)
Image Area	Full field  35 x 43 cm (14 x 17 in.) nominal active image area
Detector Pixel	139 $\mu\text{m}$ 129 $\mu\text{m}$ x 129 $\mu\text{m}$ active element size 2560 x 3072 detector element matrix 89% geometric fill factor
Presampling MTF	98% at 1.0 cycles/mm 89% at 2.0 cycles/mm 70% at 3.0 cycles/mm
Static Load	18 kg (39 lb) applied to the front surface over a nominal 10 x 10 cm (4 x 4 in.) area

## DirectRay Console

Weight	159 kg (350 lb)
Base	Width: 71 cm (28 in.) Depth: 49 cm (19 in.) Height: 100 cm (39 in.) without monitor 150 cm (59 in.) with monitor
Top Surface	Width: 84 cm (33 in.) Depth: 56 cm (22 in.)
Clearance	30 cm (12 in.) minimum on both sides 75 cm (30 in.) minimum in front
Weight	125 kg (275 lb) without monitor 156 kg (350 lb) with monitor
Electrical	US: 115 Vac, 50/60 Hz, 5 A Europe: 220 Vac, 50/60 Hz, 3 A

## Omniflex IV Overhead Tube Crane

### Weights

#### Longitudinal Rails (length used is site-dependent):

14 ft (4.27 m)	154 lbs (69.7 kg) per set of 2
16 ft (4.87 m)	177 lbs (80.1 kg) per set of 2
18 ft (5.48 m)	200 lbs (90.6 kg) per set of 2
20 ft (6.09 m)	225 lbs (102 kg) per set of 2

#### Transverse Bridge (length used is site-dependent):

8 ft (2.44 m)	175 lb (80 kg)
10 ft (3.05 m)	200 lb (90.6 kg)
12 ft (3.65 m)	225 lb (102 kg)
14 ft (4.27 m)	250 lb (114 kg)
16 ft (4.88 m)	275 lb (125 kg)

Tube/Collimator:	75 lb (33.9 kg)
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Cable & Transverse 300 lb (136 kg)  
 Carriage/  
 Telescoping Tube  
 Crane:

### **Omniflex IV Overhead Tube Crane Specifications (continued)**

Tube Rotation  $\pm 110^\circ$   
 Output Power 400 BTU/hr (421 kJ/hr)

## **Radiographic Table**

Weight	386 kg (850 lb)
Dimensions	Width: 213 cm (84 in.) Depth: 76 cm (43 in.) Height: Variable
Capacity	205 kg (450 lb) weight capacity 61 cm (24 in.) patient load
Table Top Travel	$\pm 50$ cm (20 in.) longitudinal $\pm 13$ cm (5 in.) transverse 26 cm (10 in.) vertical top travel
Bucky Travel	86 cm (34 in.) longitudinal travel 132 cm (52 in.) vertical travel
Rotation	Vertical tower rotation $\pm 180^\circ$ Vertical Bucky rotation $\pm 180^\circ$ Vertical arm rotation $\pm 120^\circ$ Portrait and transverse DirectRay Detector orientation
Electrical	Input voltage: 115/230 VAC nominal Input current: 9.6/4.8 A nominal Input frequency: 47 Hz to 63 Hz Config: Single-phase, grounded or isolated

## X-ray Generator

Cabinet Weight	227 kg (500 lb)
Cabinet Dimensions	Width: 71 cm (28 in.) Depth: 110 cm (43 in.)
Output	80 kV high frequency 100 mA @ 80 kVp 800 mA @ 100 kVp 500 mA @ 150 kVp 40 to 150 kVp 0.5 to 1000 mA
Line Voltage Range	$\pm 10\%$
High Voltage Ripple	4 kVp @ 100 kVp (typical)
Other Features	Dual speed starter AEC programmable by operator Two and three point manual techniques Manual APR/AEC override 380/440/480 Vac, 3 phase

# Environment

## Transit/Storage

Temperature:	-20° to +45°C (-4° to +113°F), assuming the DirectRay Detector is shipped in a Del insulated shipping container
Maximum gradient:	15°C (27°F) per hour, assuming the unit is stored in a shipping container approved by Del.
Relative humidity:	30 to 80% non-condensing
Maximum gradient:	10% per hour
Pressure:	11.6 to 23.2 psia (600 to 1200 hPa)
Shock:	Drop Test per IEC601-1

## Operating

Temperature:	10° to 35°C (50° to 90°F)
Maximum gradient:	5°C (9°F) per hour
Relative humidity:	10 to 75%, non-condensing
Maximum gradient:	10% per hour
Maximum altitude:	3,000 m (10,000 ft)
Maximum vibration:	0.5 G RMS
Pressure:	13.5 to 20.5 psia (700 to 1060 hPa)

# Installation Requirements

## Flooring

Leveling:	Flat and level within 3 mm (0.12 in.) in both directions over the entire equipment area.
Load-Bearing:	Capable of supporting the operating weight of the equipment. For more information, refer to the specification tables for each subsystem presented earlier in this appendix.

## Ceiling

Suggested Height:	290 cm (114 in.)
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# Glossary

Accession Number	In DICOM, a term to uniquely identify a visit to a site by a patient. The meaning and use of accession numbers is not consistent in medical information. The DirectRay System uses the DICOM definition of the term.
AEC	Automatic Exposure Control.
Antiscatter Grid	Device used to prevent the radiation scattered within the patient from reaching the DirectRay Detector and fogging it.
AP	Anterior/Posterior view position for X-ray exposure.
Artifact	Changes to an image due to outside influences such as defective pixels or DirectRay Detector scan lines.
Autoclave	The process of disinfecting articles by heating them with pressurized steam.
Automatic Exposure Control (AEC)	Ion chamber within the Bucky. Used to terminate X-ray when image density is achieved by measuring the amount of dosage occurring at the DirectRay Detector and providing feedback to the X-ray Generator to stop the exposure.
Bucky	The component that houses the DirectRay Detector, AEC, moving grid, and related components. In the DirectRay System, the bucky contains the DirectRay Detector instead of the conventional film cassette.
Collimator	The Collimator regulates the size and shape of the X-ray beam to accurately localize the area of interest on the patient, while reducing overall patient irradiation exposure.
CPU	Central Processing Unit of the DirectRay Console.
Detent	A device for positioning and holding an articulated mechanism in relation to another so that the device can be released by force applied to one of the parts.
Diagnostic X-ray System	An X-ray system designed for irradiation of any part of the human body for the purpose of diagnosis or visualization.
Digital Imaging and Communications in Medicine (DICOM)	An industry standard specification for interconnection of medical imaging equipment.
DirectRay	Trade name for the Direct Radiography Corp. DirectRay Detector and DirectRay Controller.

DirectRay Console	The DirectRay System component that houses the CPU (where the user interface runs), the DirectRay Controller, and the uninterruptible power supply (UPS). It also stores the DirectRay Console Application, the user-interface for the system.
DirectRay Controller	The interface between the DirectRay Detector and the DirectRay Console controls.
DirectRay Detector	The DirectRay Detector is a flat panel that receives the X-ray image and converts it to digital information. The DirectRay Detector replaces conventional X-ray film and cassettes.
Direct Radiography	A term used to distinguish the use of a photoconductor-based method as opposed to the X-ray capture and conversion method used in a scintillator or phosphor-based detector.
Exam Specific Algorithm (ESA)	Algorithm used to optimize raw image data for a particular type of exam.
Focal Distance	The distance from the source of the X-rays to the patient.
Generator	Device that supplies power to and controls the X-ray tube.
Hospital Information System (HIS)	In a hospital, the computer system that tracks patient demographic information, visit information, and other patient records.
Image Artifact	Non-desirable qualities on a printed image.
kVp	Peak kilo-volts. The highest energy of X-rays emitted by an X-ray tube (equal to the peak applied tube voltage).
Lateral	Possible view position for X-ray exposure.
Look-Up Table (LUT)	A table of values used to convert raw image data to output data for a specific ESA setting.
mA	Milliamperes.
mAs	Milliampere-seconds. Combined with kVp, it indicates the dose of X-rays.
Oblique	Possible view position for X-ray exposure.
Operating System (OS)	The basic software control system of the CPU.
PA	Posterior/Anterior view position for X-ray exposure.
Positive Beam Limitation (PBL)	This function automatically adjusts the X-ray field to the size of the receptor.
Procedure	A predefined collection of images (views) for X-ray exposure.
RIS	Radiology Information System.



Source to Image Distance (SID)	The distance from the source of the X-rays to the detector.
Study	A specific instance of a procedure consisting of a set of X-ray images.
Technique Factor	Any of the parameters describing the properties of an X-ray beam, including beam energy (kVp), beam intensity (mA), exposure (mAs), duration (seconds), and, at times, the Source to Image Distance (SID).
View	Prescription for the technique factors and geometric arrangement of the X-ray source, patient, and image sensor that yields an image of organs of interest seen on a specific orientation.
Visit	A set of studies identified in a locally unique manner and performed on a particular patient at a particular site for a particular reason. A visit is normally identified by an accession number or a Visit ID and is associated with a diagnosis.

